

FROM THE EDITORS OF

DOS RESOURCE GUIDE

FEBRUARY 1994
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13
WINDOWS
TIPS

RUNNING **DOS** **AND** **WINDOWS** **IN HARMONY**

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Brian Livingston Reveals 3 Windows Secrets Guaranteed to Succeed

“... it ranks as the most powerful application ever written for DOS, with conveniences that rival a fully equipped Windows setup.”

PC MAGAZINE: NOVEMBER 9, 1993

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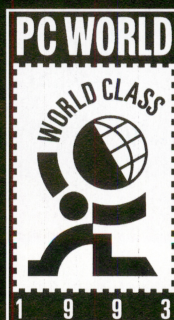
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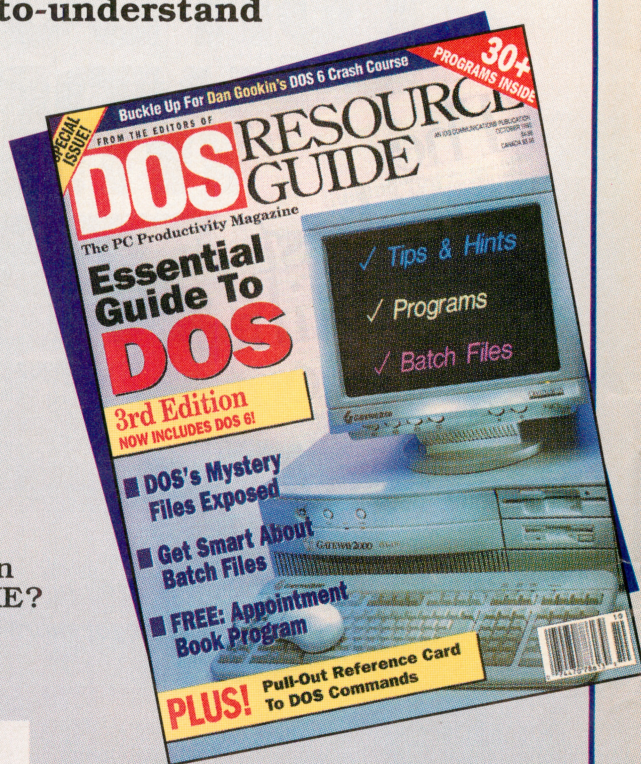
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RUNNING DOS & WINDOWS

IN HARMONY

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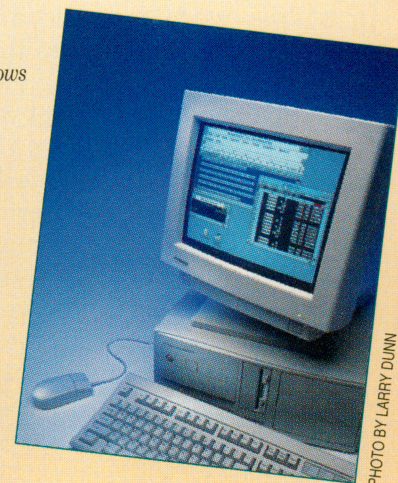


PHOTO BY LARRY DUNN

Pictured on our cover is Hyundai's 66MHz 466DDV desktop and 15-inch noninterlaced VGA color monitor.

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WINDOWS IS NO Clear Choice

by Eric Maloney

As computer users, we're a practical lot. We like a program only as long as it serves our needs. Give us a better choice, and we unhesitatingly exile our old software to a dark, forgotten corner of our hard drive, where it gathers microdust until the day we decide to delete it.

Thus it has come to pass that many devout DOS users are moving to Windows. Count me among them. After staring at command-line prompts of one kind or another for 14 years, I settled into Windows after only a few steady months of use while preparing this issue.

That said, I must now issue several qualifiers:

Windows can make life easier for the DOS user, but boy, is it ugly to use. It is not the powerful yet simple computing environment Microsoft claims in its over-wrought (and over-bought) marketing hyperbole. Windows is too clumsy and complex to deserve such praise.

Also, I haven't stopped using my DOS software. In fact, my major reason for using Windows is that it improves my DOS programs' performance. Windows might well be the biggest, lunkiest DOS enhancer ever created. The program squats gracelessly across a huge expanse of disk space like an airport hangar built for L-1011s but housing Pipers. The massive amount of overhead needed to keep it running is wasteful.

Windows' qualities are not subtle, yet its advantages are ample.

The purpose of this special issue of *DOS Resource Guide* is to explain these advantages. By teaching you how to set up Windows, run your DOS programs from within Windows, and fine-tune your system, we hope to make your transition easier and, ultimately, reduce the time you need to be an efficient DOS/Windows user.

But what about the benefits and costs? What does Windows offer and what does it take away? Here are a few thoughts on what you can expect.

Windows' Gains

Windows' usefulness falls into five areas:

- Windows lets you run several programs at once. Moving among programs is easy—one of the few Windows tasks that can be so described.
- Windows manages your memory invisibly. You don't have to worry about whether you've got enough memory allocated for the second or third program you load.
- Windows lets you move data among programs, whether they are Windows- or DOS-based. For DOS programs, using Windows' Clipboard is an aggravating, multistep process, but it's easier than many of the more traditional alternatives, such as saving part of the first program's file to disk and merging the file into the second program.
- Some useful programs run only under Windows. This isn't necessarily because Windows inherently makes software better. It's simply because software houses are writing their new programs for Windows. (The reasons for this decision are complex. Suffice it to say, statistics show most new users choose Windows over DOS.)

(Continued on page 6)

Eric Maloney is the former Editor in Chief of *80 Micro*, the founding editor of *PC Resource*, and formerly, Editor in Chief of *LAN Technology*. He is *DOS Resource Guide*'s Editor at Large.

DOS RESOURCE GUIDE

RUNNING DOS. & WINDOWS

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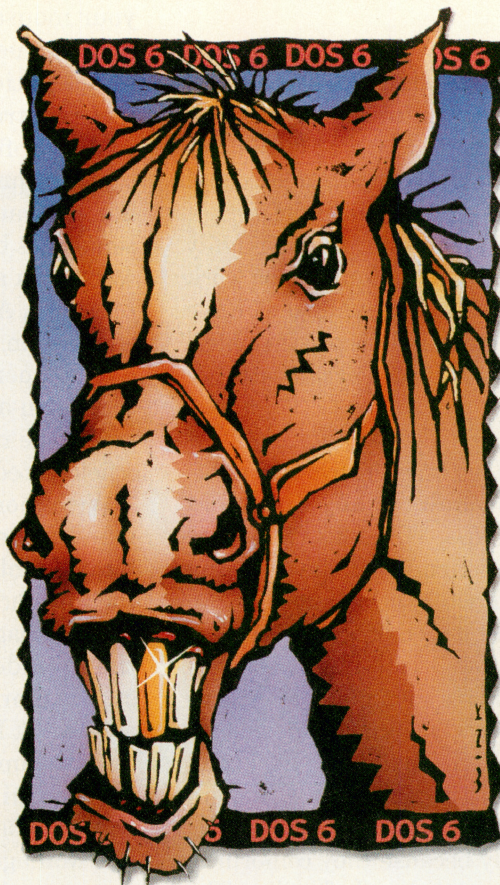
What does more memory mean in a practical sense? It means that your DOS and MS Windows programs run faster, smoother and more reliably. It means you can continue to add valuable utilities, drivers, TSRs and new capabilities to your PC. Whether it's workhorse drivers like LAN utilities and fax drivers; productivity-enhancers like disk caches and disk compressors; or fun and exciting capabilities like sound boards, CD ROM drivers, graphics tablets, etc. The better your memory is managed, the more versatility and flexibility your PC will have. QEMM 7 lets you have it all without fear of 'out of memory' messages or crashes.



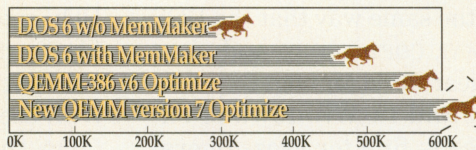
DOS 6 Giveth; DOS 6 Taket Away

The best feature of new DOS 6 is the stable of utilities it includes. Trouble is, they all eat up memory. DoubleSpace file compression needs 43K, Vsafe anti-virus needs 745K, Smartdrv disk cache needs 28K and even Undelete takes 10-14K as a resident program. Using MemMaker, you could easily lose—not gain—available 'conventional' memory in DOS 6.

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We tested DOS 6 with and without MemMaker and QEMM6 and our new QEMM 7 runs away from all of them. See details of test conditions at bottom of page.

80%, ensuring that the all-important memory below 640K is free for your programs. And QEMM 7's seemingly small feature of supporting

DOS 6's multiple configurations gives you the flexibility and ease of setup that you expect. (MemMaker doesn't work well with this important DOS 6 feature.)

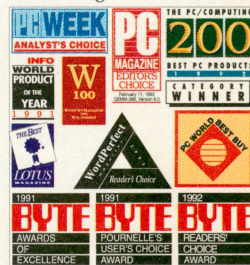
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You sacrifice all this when other memory managers turn off the page frame. Stealth saves you

room to set up your PC with a mouse, CD ROM, sound board, a network such as Novell NetWare, create 8-24K of extra memory for optimal MS Windows performance, use all of DOS 6's memory-hungry utilities and still have more than 630K to run applications smoothly and safely.



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How we got the chart numbers: CPU—486/33 ALR Power/business VESA machine equipped with 16 megs of RAM and running MS-DOS 6. Comparisons were done using the following memory managers: QEMM 7, QEMM 6.02, MS-DOS 6 MemMaker. In addition to the driver (or drivers) required by each memory manager, the following drivers, DOS resources and programs were loaded for all comparisons: IN THE CONFIG.SYS file: SETVER.EXE, DOS=HIGH, FILES=20, BUFFERS=10, STACKS=0,0, MVSOUND.SYS, SNDISK2.SYS, SLCD.SYS, DOS SHELL=statement, in the AUTOEXEC.BAT file: VSAFE, MSCDEX, UNDELETE, LSL.COM, NE2000.COM, IPXODI.COM, NETX or EMSNETX, MOUSE.COM, SMARTDRV.COM, PRISCCAP.COM. ©1993 Quarterdeck Office Systems. Trademarks are property of their respective owners.

Circle 107 on Reader Service Card

(Continued from page 4)

● Finally, you can set up a DOS window and switch to it any time you want. This is critical for DOS users who continue to rely on favorite DOS commands and utilities. It's also comforting when you're just plain sick of Windows and want to spend some time on familiar turf.

Note that these features result in thoroughly practical gains; users get more and better work done in less time. Windows' advantages have nothing to do with its much-ballyhooed graphical user interface (GUI) or its alleged ease of use.

Windows' Pains

Windows' benefits are big ones. They have to be, to compensate for Windows' many disadvantages. First and foremost, Windows is another program you have to learn—and the learning curve is steep. Windows is a big, sprawling, messy piece of software, much of which is devoted to managing itself.

Microsoft and its cohorts somehow have created a myth that Windows' graphical interface is more intuitive than DOS. The idea that a computer interface is intuitive is absurd. Every interface must be learned. We learn some interfaces more quickly only because they conform to standards with which we're already familiar. The Windows interface might be easier for some users to get started with, because menu bars let you step (or fumble) your way through various procedures, but it is in no way intuitive.

At the least, you have to know how to create Program Information Files (PIFs) and icons for your DOS programs. If you want to run programs simultaneously or move data among programs, you need to know how to fiddle and diddle with your Windows settings. If you want to manage your files in the same way that the DOS commands DIR, FORMAT, COPY, XCOPY, and MOVE do, then you have to learn File Manager.

Also, moving around in Windows is exhausting. The mouse is fine for gross operations, such as clicking on a tiled application that fills half your screen. But using one for pulling down menus and making selections in dialog boxes is silly and annoying. Try moving

your mouse pointer smoothly from one corner of the screen to another and clicking precisely on an option button. It's like using a TV remote control while wearing mittens.

Microsoft doesn't make using the keyboard easier. Equivalent keyboard combinations often are awkward or hard to remember. For example, some keys have different functions depending on where you are in Windows. In a full-screen DOS program, Alt-Enter reduces the program to a window. In Program Manager, the same combination opens a Program Item Properties box. The down-arrow key in a Program group moves you to the next item; in a dialog box, it can open a field for editing or open a list of options.

With mouse or keyboard, the possible command sequences in Windows are endless. This is unavoidable in a graphical interface, because the interface must give you access to every possible management function. But the trade-off is that Windows' functions often involve more steps, more time, and more irritation than equivalent DOS functions.

For example, creating a new subdirectory in DOS requires that you type the simple command MD DIRNAME. In Windows, you have to load File Manager, move the mouse pointer to the directory under which you want the subdirectory, click on the directory, move the mouse pointer to File in the menu bar, click on File, click on Create Directory, type the name of the new subdirectory, move the mouse pointer to the OK button, and click on OK. If someone can tell me how this is simpler and more intuitive than typing MD, I'd love to hear the argument.

Life After Windows? DOS, of Course

After years of typing DOS commands, using DOS extenders and utilities, and creating batch-file shortcuts, I find Windows to be a lumbering alternative to DOS. I think many experienced DOS users will agree.

On the other hand, we shouldn't ignore Windows' ability to amplify and enhance DOS's features. After all, we use computers to do our jobs more effectively. If Windows is a suitable means toward that end, so be it. ■

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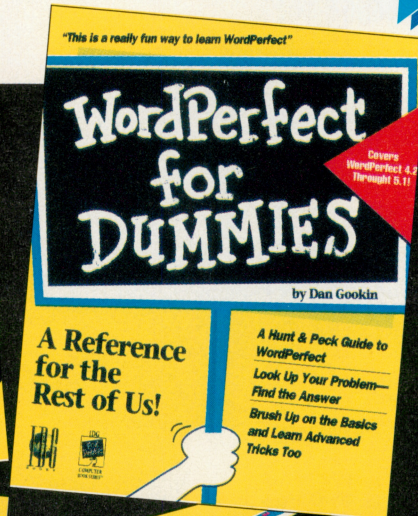
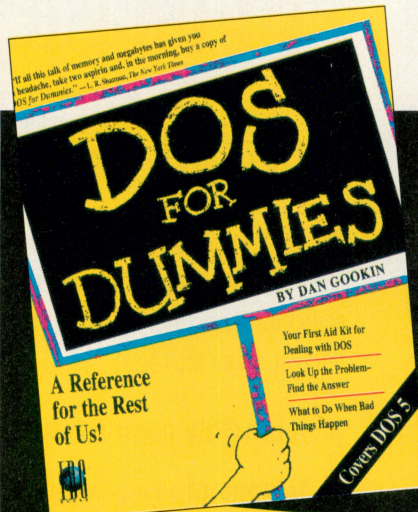
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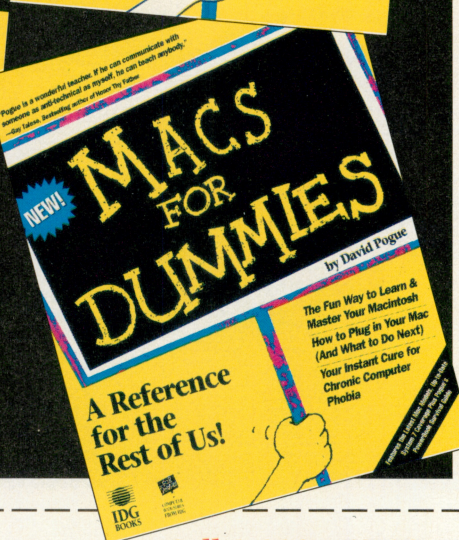
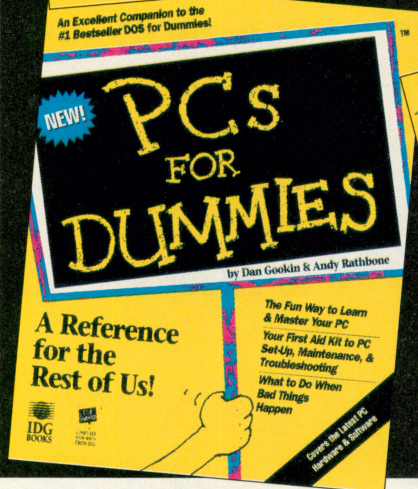


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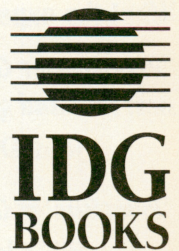
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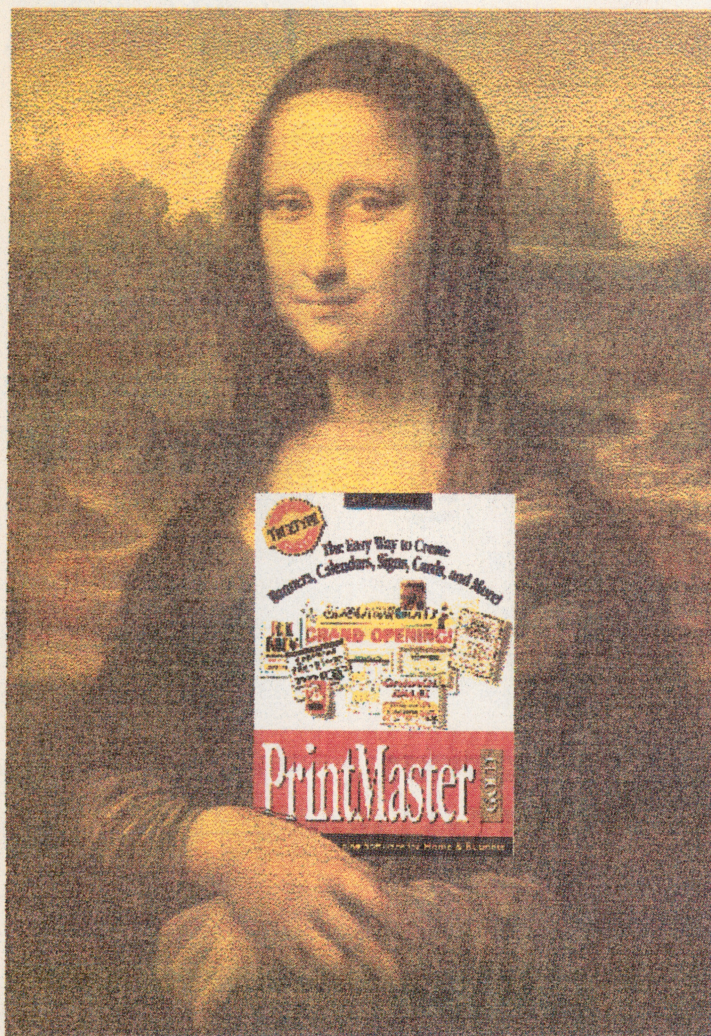
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DOS AND WINDOWS: A Powerful Team

Here's what to expect from your existing software—
and hardware—when you attempt to harness Windows'
power for the good of your DOS programs.

by Stan Miastkowski

MICROSOFT WINDOWS IS TAKING OVER THE WORLD OF COMPUTING! OR is it? A DOS user could easily get that impression. Just count the many magazine articles and advertisements that praise each new Windows application. And try to find similar new DOS applications; your choices are becoming slim. □ If you're thinking about the future, you may be thinking about Windows. Making the decision to plunge into the world of Windows might seem a difficult one—especially if you have a stable of DOS-only applications that are more like old friends. But did you know that using Windows is an excellent way to get more mileage from your

DOS applications? You don't have to throw them away. Yes, you have to make some changes in the way you work. And you have to contend with Windows' learning curve. In most cases, however, you'll find the results well worth the effort.

What Is Windows Anyway?

Since Microsoft introduced Windows 3.0 (the first successful version of the product) some five years ago, a blizzard of marketing hype has spread confusion among users. Microsoft is

fond of referring to Windows as an operating system, but it is not.

To put things in perspective, think of Windows as an involved DOS shell or a sophisticated version of what happens when you temporarily exit, or shell, to DOS while running a DOS application. It isn't magic. Windows essentially "sits on top" of your PC's base operating system (DOS) and provides a graphical user interface (commonly known as a GUI). It also offers a consistent means of using applications, although only Windows-specific pro-

Stan Miastkowski has been translating computer technology into English for more than 15 years. He is coauthor, with Anne Fischer Lent, of *The Windows for Workgroups Bible* (Addison-Wesley, 1993).

grams can take advantage of that consistency.

Windows' underlying technology is much more complex than is DOS's. Its biggest claim to fame is a built-in set of services that all Windows-specific applications may use. For example, the File Manager delivers a consistent means of finding files that is much more advanced and capable than DOS's limited DIR command.

Then, too, instead of each application needing its own print driver, Windows programs share one. In fact, Windows has become popular partly because it lets software developers concentrate on the details of their applications and frees them from the mundane, yet essential, chores (such as those print drivers) inherent in developing DOS applications.

Doing Two Things at Once

It's important to repeat that the DOS applications you run from within Windows can't take advantage of Windows' built-in features. Nevertheless, you'll find compensations that make running DOS from within Windows distinctly worthwhile. Most significant is Windows' ability to switch between programs and multitask applications, including DOS-only programs.

If you often use a few DOS applications, the chore of repeatedly closing one program before you open another can become tiring. When you run DOS in Windows, you can load several DOS programs and switch among them with a single key combination. Such task switching can increase your productivity dramatically (see the figure "Task Switching").

You might think of multitasking as the computer equivalent of patting your head and rubbing your stomach at the same time (see the

figure "Multitasking"). Although multitasking is considered one of Windows' biggest advantages, it comes with a few caveats for DOS users. Windows needs more horsepower than does DOS. While DOS uses only a small amount of your PC's processor power, Windows pushes your PC close to its limits. And the more applications you intend to run at the same time, the more processor power, RAM, and hard disk space you'll require.

In practical terms, Windows multitasking requires at least a 386SX microprocessor; a 286-based PC can't handle today's large programs with speed. You also need at least 4MB of memory and a hard disk with enough space to hold Windows and its applications. (See "Investing in New Hardware," page 13, for more on the subject of Windows' minimum daily requirements.)

Setting up multiple DOS applications can be tricky, although it doesn't have to be. By default, Windows puts the DOS applications you have loaded but aren't using into a state of suspended animation. To have them work in the background (printing a file or sorting a database, for example) instead of being frozen, you must fiddle with a program information file (or PIF), which tells Windows how it should run each DOS program. Most major DOS programs now come with a PIF. DOS programs without a PIF use a default PIF included within Windows.

DOS Programs You Can Take with You

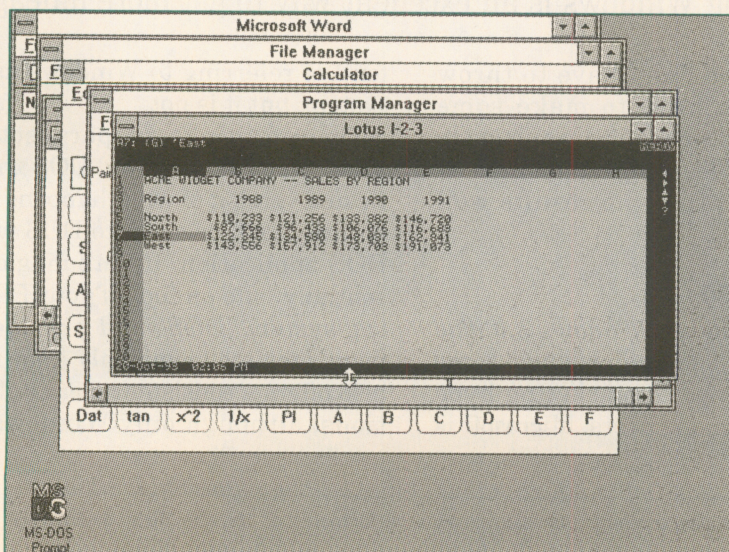
One of the most often-asked questions among DOS users is, "Can I use all of my DOS programs?" The answer is yes...with some exceptions. Most major DOS applications written in the last three to five years, such as spread-

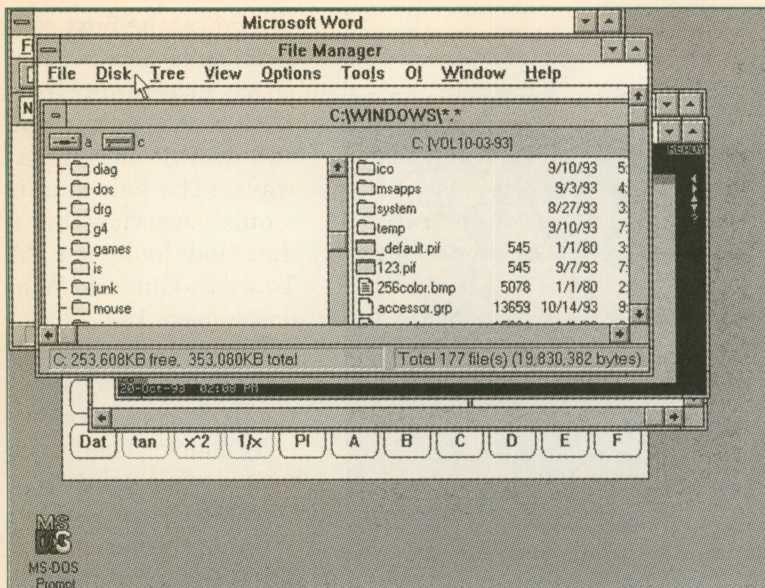
sheets, word processors, databases, and so on, run just fine from within Windows.

Some problems occasionally occur with older DOS programs that use copy protection. Also, some DOS-only games don't run properly. The trouble isn't with Windows; some programmers write applications that break rules of "well-behaved" DOS programs and use shortcuts to circumvent DOS's limitations. These shortcuts may cause Windows, which expects certain behavior from DOS programs, to crash. In general, if you're a

Task Switching.

Windows lets you load more than one program at once. Here, the user switches from a Word for Windows text file to check some spreadsheet numbers in the DOS version of Lotus 1-2-3.





Multitasking. The ability to do more than one job at once is called multitasking.

If necessary, the user could search for a list of files for printing while his or her word processor spell-checks a long document.

heavy game player, you'll find it safer to exit Windows before the games begin.

DOS communications programs (such as Procomm Plus) also create special challenges for Windows, because they take nearly total control of your PC's hardware. Although you can run a DOS communications program from within Windows, you can't switch out of that program and work in another DOS application (multitask) while your communications software is still running. This means that you can't, for example, begin a long file transfer from an on-line service, such as CompuServe, and then switch to another program within Windows.

Communications applications designed exclusively for Windows (Procomm Plus for Windows, for example) can work in the background. So, if you want to multitask a communications program in Windows, a Windows-specific program is your only option.

Popular utilities, such as diagnostic programs and hard disk "defragmenters," pose still other problems for DOS-within-Windows users. These programs usually work directly with your PC's hardware. In the worst, albeit rare, cases, running some DOS utilities from within Windows actually can damage files or make your hard disk unreadable.

Luckily, Windows usually is smart enough to sense what a utility is trying to do and "trap" it before it does any damage. Windows then presents a message on screen directing

you to run the utility from outside of the graphical user interface. But again, utilities written more than a few years ago often use nonstandard methods, and damage may occur.

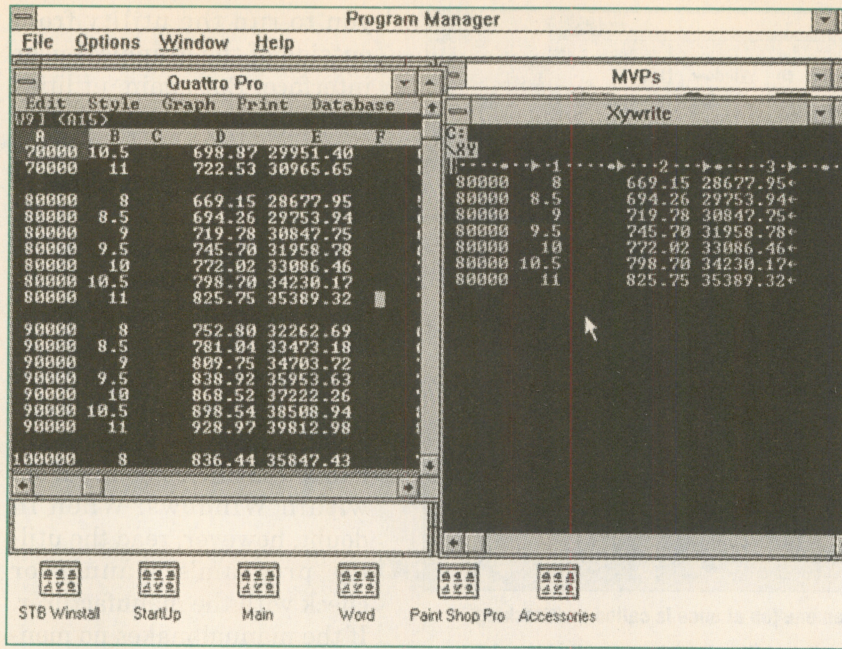
Most contemporary DOS utilities—the ubiquitous PC Tools or The Norton Utilities, for example—were written to coexist peacefully with Windows. Installing them even creates icons you can use to run the utilities easily from within Windows. When in doubt, however, read the utility program's manual or check with the manufacturer. If the manual makes no mention of Windows, your safest bet is to run it from outside of Windows.

The Look and Feel of DOS in Windows

A DOS application running from within Windows looks and behaves exactly the same as when running under DOS alone. You use it in exactly the same way, too. In fact, it's easy to forget you're running DOS programs from within Windows.

Generally, you don't see any difference in performance, either. The exception comes when you're multitasking several DOS applications, especially on a system with a low-powered processor or one with limited RAM. In cases like these, performance can suffer, because Windows needs to "swap" pieces of applications to and from your hard disk as they're required. Usually, you barely notice that this is happening, but the time lag can become annoying in a system with less than 4MB of RAM or one with an older hard disk with a slow access speed. The easiest solution is to run fewer programs at the same time. Of course, you also can upgrade your PC by adding more RAM or replacing your hard disk with a model that has a higher capacity.

One extra that Windows does offer DOS programs, however, is the capability of running in a window (see the figure "Running a DOS Application in a Window"). To exercise this option, you simply press a couple of keys. The problem is that the size of the window makes characters smaller, so using windowed DOS applications usually isn't practical. But, it is



Running a DOS Application in a Window. Squeezing your DOS programs into windows lets you use the Windows Clipboard to copy data from one program to another. In this example, a block of figures was copied from a spreadsheet into a word processing file.

one way to remember that you have DOS programs running while you're working elsewhere in Windows.

DOS programs also can use the Windows Clipboard, and this can be a big advantage. You can mark and cut text from a Windows application (a word processor or spreadsheet, for example), store it temporarily in the Clipboard, and then paste it into your DOS application. Unfortunately, the Clipboard's cut operation works only in one direction; you can't cut from a DOS application and move the cut text into a Windows application. You can, however, copy text from a DOS program into the Clipboard and then paste text to a Windows program or another DOS program.

Hitting the Curve at High Speed

Before you start using DOS from within Windows, you must tackle the Windows learning curve. It's not difficult, but using a graphics-oriented environment does require a shift in thinking, especially if you're an old hand at typing commands at the DOS prompt. You'll need a mouse, too. Although you can move around in Windows using keyboard commands, it's neither easy nor convenient. Luckily, Windows provides an informative self-running tutorial that steps you through the basics.

After you become familiar with the basics of

Windows, the next step is to learn how to start DOS programs from within Windows. You can do this in several ways. (The following is a quick overview. For a detailed look, see "A Tourist's Guide to Windows," page 19.)

The easiest, although most limited, way to enter DOS from Windows is by double-clicking the mouse while pointing to the MS-DOS icon in Windows' Main group. This brings up a full-screen version of DOS, complete with the familiar DOS prompt. You type the commands that run your program as you usually do.

To gain the power of Windows' multitasking, you can start multiple DOS programs by using the Run option in Windows' pull-down File menu. Up pops a screen with a command line into which you can enter any DOS or Windows command.

The third, and by far the most useful, method of running DOS applications from within Windows is to create icons for your DOS programs. You can use the New option in the File menu to do this. The process doesn't have to be a manual one, however. Some DOS programs automatically create an icon when you install them.

The PIF Editor, also under the Main group, is your key to customizing DOS programs to run under Windows. It lets you control how the program uses Windows' resources. As mentioned above, many DOS programs already come with their own preset PIFs. (For more on PIFs, see "Doing DOS Under Windows," page 27.)

A Winning Combination

Yes, you can get along without Windows. But, despite its steep learning curve, the advantages of running DOS applications from within Windows make tackling the curve a worthwhile endeavor. And being able to run a combination of DOS and Windows applications adds other advantages. Perhaps the greatest is that you can choose from among the best programs of both worlds to get your work done. ■

INVESTING IN New Hardware

What you really need to run Windows effectively.

by Anne Fischer Lent

MICROSOFT WOULD LIKE YOU TO THINK YOU CAN RUN WINDOWS ON just about any PC. True, you can get Windows 3.1 going on an 80286 or even an 8088 PC, but why would you want to? Older systems can't run several programs at the same time, can't use enhanced graphics, are excruciatingly slow, and can't run many Windows programs. ☐ Because of these limitations, you shouldn't consider Windows unless you have at least an 80386SX. Beyond this minimum, your choice of processor, amount of memory and hard disk space, and type of display depends on your needs.

What's adequate? You can get by with a 16MHz 386SX with 2MB of RAM, an 80MB hard drive, a 3.5-inch floppy drive, a 14-inch VGA monochrome monitor, and a mouse. If you're buying a new system, go for at least a 25MHz 386DX with 4MB of RAM, a 100MB hard drive, a 3.5-inch floppy drive, a 14-inch VGA monitor, a video accelerator card, and a mouse. Fortunately, you can get more for your money than you could just a few years ago, and you may find that a 33MHz 486DX with 6MB of RAM, a 200MB hard drive, and a Super

VGA monitor now fall within your price range (see the sidebar "Hardware Configurations").

Before you look at Windows' hardware requirements component by component, you should consider what you want to do with your system. How you use your computer influences how much muscle you need.

Why Windows?

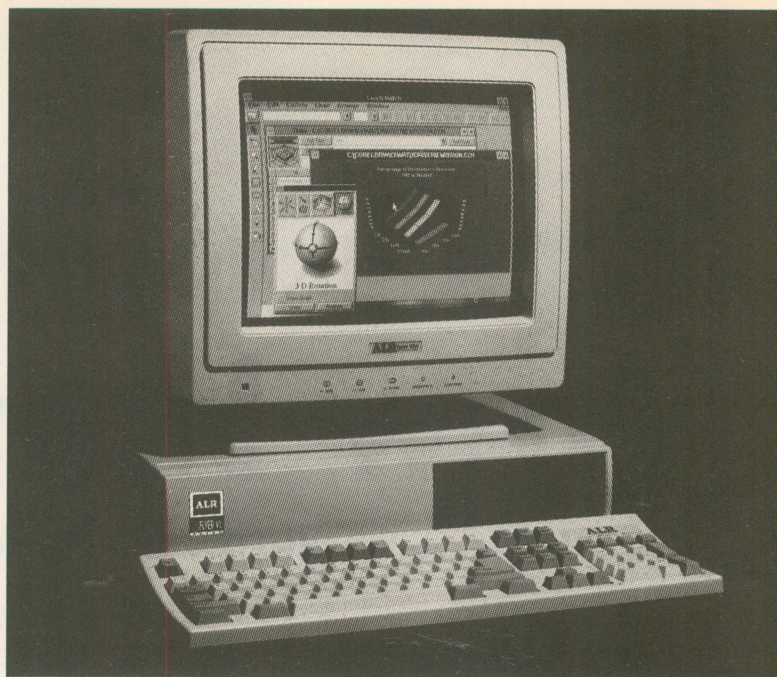
One of Windows' biggest attractions is its ability to do multitasking. If you want to be able to run more than one program at the same time,

an 80386 system is essential.

Older systems let you do task switching. However, the difference between task switching and multitasking is the difference between cooking on a hot plate and on a four-burner stove. Task switching lets you load several programs and move among them, but only one program may be active. Multitasking lets your programs share the processing power of your CPU (Central Processing Unit). This means that in addition to having the programs loaded, they actually can be processing information simultaneously. For example, you may put your database manager in one window and your word processor in the other. While the database manager is in the background processing information, you may work on a word processing file.

An 80386 lets you multitask, but other components determine how *well* you multitask. The more programs you load, the more memory and speed you need.

Enhanced graphics, another of Windows' attractions, also place demands on your hard-



Windows uses a lot of juice, and ALR (Advanced Logic Research), among other manufacturers, has produced a line of so-called "green machines," energy-efficient microcomputers that borrow power-down technologies from many of today's laptops. ALR says its local bus micros, which run at up to 66MHz, will suffer no performance lag while you are saving energy. Prices start at under \$1100.

ware. Windows itself will work—although poorly—with an EGA monitor, but many Windows programs are written for VGA. If you plan to use software optimized for Windows, VGA is essential.

Also, enhanced graphics require considerable processing power if they are to function quickly and smoothly. You'll need a Windows-optimized video card, most of which have dedicated video processing chips to relieve the processor of having to draw all those windows and graphics characters.

This special issue concentrates on how to run DOS and Windows together. However, the chances are that once you have Windows, you'll start looking at Windows-specific software. You'll quickly find that Windows programs take more resources than equivalent DOS programs. They can eat enormous expanses of your hard disk and demand generous amounts of memory. If you've got your eye on a few Windows programs, find out what they need to run before you determine the specifications of your Windows PC.

Finally, some programs make more

HARDWARE CONFIGURATIONS

These configurations range from the barely adequate to a fully capable Windows system. The adequate configuration will let you run Windows itself, but you won't have much room for Windows applications, and multitasking will be sluggish. The midrange setup is faster, offers more storage capacity, and gives you Windows in color. The recommended configuration is what you might look for if you were going out to purchase a new system for Windows work. With prices of desktop systems tumbling, today you can get a powerhouse of a system for the same price that an 8088-based XT sold for a few years ago.

HARDWARE COMPONENTS

RANGE OF CONFIGURATIONS

	Adequate	Midrange	Recommended
CPU	16MHz 386SX	25MHz 386DX	33MHz 486DX
Memory	2MB	4MB	6MB
Storage	80MB	100MB	200MB
Graphics	14-inch Mono VGA	14-inch Color VGA	15-inch Color SVGA
Mouse	Yes	Yes	Yes

demands on the processor than others do and require more speed. For example, if you work with large, complex spreadsheets, you'll spend a lot more time waiting for your recalculations on a 16MHz 386 than on a 66MHz 486.

Processor

The central processor, or CPU, is the chip that powers your computer system. Your major choice is in speed, which is measured in megahertz.

These days, 25MHz or 33MHz computers are about the slowest you can buy. Either is fast enough for Windows. 80486 computers run faster than 80386 computers rated at the same speed, because they contain extra processing circuitry.

Before you decide how fast your computer should be, consider how you will use it. Speed is less of a factor with text-based programs, such as word processors, than it is with graphics programs, such as computer-aided design software. Also, multitasking—one of Windows' biggest attractions—can slow your programs (see the sidebar "Slo-Mo Multitasking"). If you see major multitasking in your future, go for a system with a faster CPU, even if you have to pay a little extra.

Memory

Unlike DOS, which only uses the first 640K of RAM, Windows uses all the memory you have, so the more RAM the better. You can get by with 2MB, but 4MB is the current minimum, and that figure is likely to increase as programs become bigger and more complex. If you need a guideline, it's this: Buy as much memory as you can afford.

When you run Windows in Enhanced mode, the processor uses the RAM or the hard disk as swap space for the programs and other processes it has to handle simultaneously. RAM is much faster, so the more you have, the better your performance. You particularly will notice the advantages of more memory when you are multitasking.

You can add memory simply by plugging memory chips into the motherboard, and most systems let you go up to 64MB. Some even come with an extra slot for another memory board, so

you can (almost) keep adding RAM to your heart's content.

Drive

80MB is the bare minimum for hard disk capacity, but 200MB is more realistic.

MS-DOS 6 and Windows 3.1 alone take nearly 25MB. If you plan to buy any major Windows

SLO-MO MULTITASKING

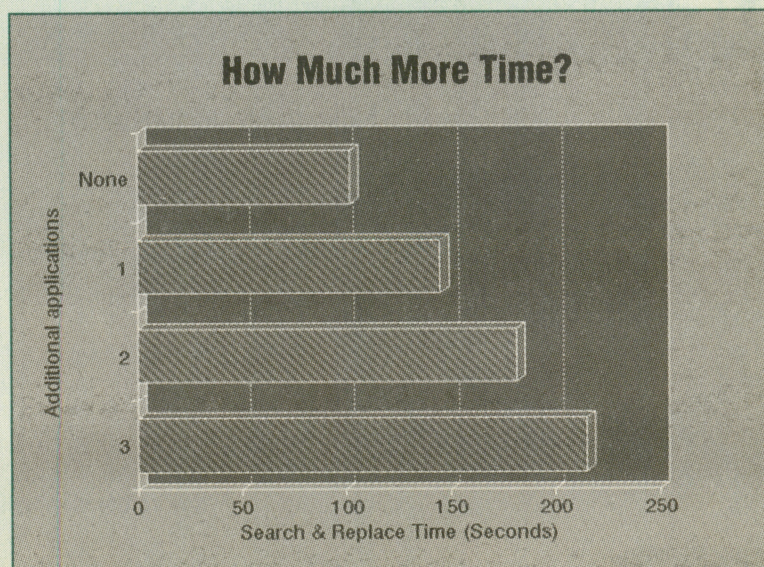
How much impact does multitasking have on the speed with which programs perform tasks? To find out, we ran a simple search-and-replace procedure in the DOS version of XyWrite, using four test conditions. As the graph shows (see below), the more the computer had to do, the slower XyWrite performed.

The procedure was to search a screen full of periods and replace them with commas. We ran the test first with XyWrite running by itself under Windows. We repeated the test with Quattro Pro for DOS running its own search-and-replace operation in the background. Then, we added a batch file echoing a line of text to screen in an endless loop. Finally, we added Word for Windows, loaded with an inactive text file. All tests were conducted on a 66MHz 80486 machine.

Alone, XyWrite did the job in a shade over 100 seconds: 1:42. With Quattro Pro churning away in the background, the time increased to 2:25, a jump of 42 percent. Adding the batch file increased the time another 36 seconds to 3:01, a jump of another 25 percent. Finally, with Word sitting idly in the background, XyWrite took 3:35 to search for the periods and replace them, an additional 19 percent. In all, XyWrite took more than twice as long to perform the operation while sharing processing resources with three other applications as it did to perform the test by itself.

You can fine-tune Windows to run your programs more efficiently. However, as our test shows, Windows is a resource hog; the faster your computer, the smoother will be your Windows sessions.

—Eds.



applications, figure on at least 12MB to 15MB for each. A basic setup consisting of a word processor, spreadsheet program, database manager, and a few utilities may take 50MB—and that's before you start adding data files.

You must choose between two types of drives: integrated drive electronics (IDE) and small computer system interface (SCSI). IDE drives are easier to install and are by far the more common. SCSI drives can outperform IDE drives for some applications, such as multimedia and high-end graphics. SCSI drives also are more flexible, because they let you connect to as many as six other SCSI devices. But most people choose an IDE drive unless they have a particular need for SCSI.

Monitor

To get the most out of Windows, you should have a color VGA graphics card and matching color monitor. Standard VGA can display 640 by 480 pixels in 16 colors.

Super VGA, the next step up, is superior for



A number of manufacturers have introduced graphics accelerator cards, designed with separate high-speed chips whose only purpose is to move streams of data to your screen. Cardinal's WarpSpeed (\$599) local bus graphics accelerator with 2MB of memory will deliver resolutions as high as 1280 by 1024 pixels to monitors capable of rendering resolutions that high.

graphics applications. Super VGA offers a resolution of 800 by 600 pixels and can display as many as 256 colors. The extra colors are useful when you're working with graphics, and the higher resolution improves the appearance of your Windows Desktop. Numerous graphics boards offer even higher resolution and photo-like colors, but such boards are much more expensive.

Although you may use a monochrome VGA monitor, Windows uses color to organize elements. Windows screens simply don't make the same impact when you view them in black and white. You may use a color graphics adapter (CGA) or enhanced graphics adapter (EGA) monitor, but their limited resolutions make them impractical for Windows.

The size of the monitor also is important. Although you can get by with a 14-inch model, you'll get the best results with a 15 or even a 17-inch monitor. Higher resolution lets you display more dots per inch, and therefore more characters, on screen. Because of this, the bigger the monitor, the more windows you may fit on screen at one time, which is an important con-

TIP MEMORIZE IMPORTANT KEYBOARD SHORTCUTS

Windows has a mind-numbing array of arcane keyboard shortcuts. Don't try to learn them all at once; just concentrate on the 10 most useful ones:

- Ctrl-Esc brings up the Task List.
- Alt-Tab switches you among the programs that are running.
- Ctrl-C copies what you've selected.
- Ctrl-X cuts what you've selected.
- Ctrl-V pastes what you've selected (the information in the Clipboard).
- Tab moves the cursor from area to area in a dialog box.
- Enter selects the default command button (the one with a heavy border).
- F1 brings up a Help screen.
- Ctrl-F4 closes the active document window in an application.
- Alt-F4 exits you from Windows if Program Manager is active or exits you from the active program.

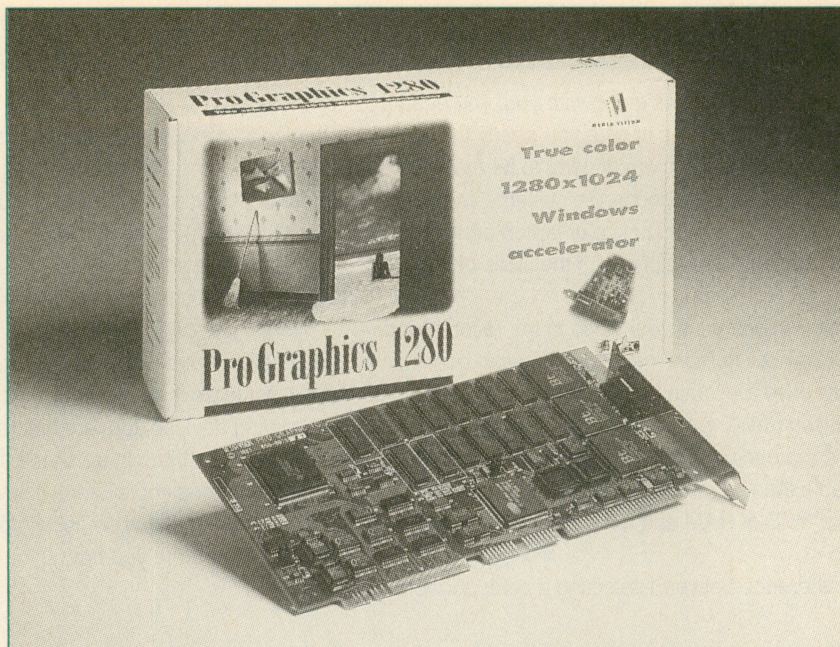
—Kay Yarborough Nelson

sideration when you're multitasking.

The downside is that the bigger the monitor, the heavier it is, and the more radiation it can emit. If you'll be staring at a monitor for hours on end, you may want to find one that complies with the Swedish MPR II and TCO guidelines for low-frequency emission.

Refresh rate, or the amount of flicker on screen, is another consideration, especially if you're in front of the monitor for extended periods. To eliminate eyestrain, get a graphics card that uses a 70Hz refresh rate, which is the number of times per second that the screen image is redrawn. The lower the refresh rate, the greater the flicker, and the more eyestrain and fatigue you'll feel.

Other considerations include power consumption and glare. New "green machines" have monitors that go into sleep mode, just as lap-



One of the newest entries in the field of graphics accelerators is from Media Vision, whose Pro Graphics 1280 (\$995) displays 1280 by 1024 resolution at a refresh rate of 72Hz.

tops go into standby mode to save battery life. You can combat glare by getting a filter that fits on the monitor.

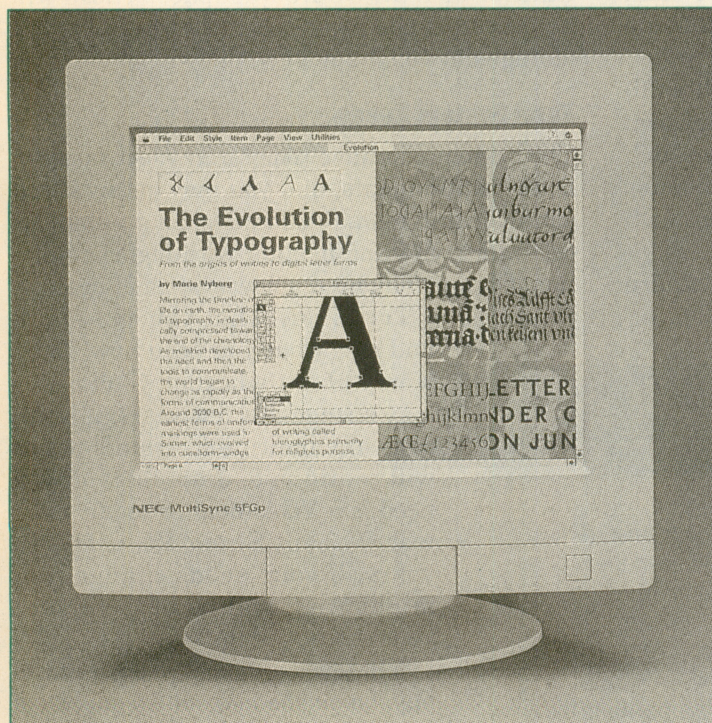
Graphics Cards

Because so much of Windows' work involves graphics, and screen redrawing can be painfully slow, you may want a high-speed graphics accelerator card (as opposed to a standard VGA card) to speed up your video. These new boards include a coprocessor chip to offer several functions to speed the creation of graphics and text in applications such as word processing, spreadsheets, or illustration. For maximum resolution and color, you should have at least 2MB of video memory, although 1MB is adequate.

Mouse

Windows' graphical user interface was designed for a mouse. You may use keyboard combinations, but moving around the screen with the mouse pointer is easier. You may choose among many types of mice, and finding the one that works best often is a matter of personal preference.

A mouse should be accurate and offer a good response, but it also should feel right in your hand. In addition, you should consider how



NEC's monitor, the .28 dot pitch 5FGp, has a maximum resolution of 1280 by 1024 pixels at a refresh rate of 60-74Hz. The 17-inch monitor lowers magnetic field emissions to meet Swedish MPR II.

TAKING WINDOWS ON THE ROAD

When you need to take Windows along with you, you need a portable computer that's going to give you nearly the performance of your main desktop system. It used to be that the only affordable portables were monochrome systems equipped with floppy drives. But today the cost of color laptop and notebook computers is coming down, along with the sizes of the systems.

Shoot for a configuration that is very close to the recommended minimum for a desktop. In most instances, you can go with a lower capacity hard drive, because you don't store as much on a system with which you travel. Go for the most RAM you can afford, because it's more expensive and more difficult to upgrade memory in a portable than in your desktop system. A 25MHz 386DX with 4MB or 8MB of RAM and a 60MB or 80MB hard drive should do.

One important difference between selecting a color portable

and selecting a desktop system is in your choice of screens. With color portables, you can choose an active-matrix LCD or a passive-matrix LCD. Active-matrix LCDs produce bright colors, sharp contrast, and crisp images, and they offer faster response times. These features add up to better readability, which can be important on a small screen. Passive-matrix systems are less expensive but offer poorer readability.

Weight and battery power also are important considerations. Most color portables weigh six pounds or more, and batteries don't last more than two hours with continuous use.

Pointing devices, too, are different on portables, but you should choose them in much the same way as you choose a pointer for a desktop system—by what feels right and offers a good response. Many come with odd little trackballs built in or as options. Try before you buy.

—A.F.L.

easy it is to install. If you're not fond of standard mice, you might consider a track ball, pen mouse, or cordless mouse.

Special Needs

Some programs demand more of your hardware. Computer-aided design software, for instance, needs a math coprocessor, which is a separate processor that handles mathematical computations. The math coprocessor relieves the main processor of the computationally intensive work. It costs around \$100.

Graphics-intensive applications, such as illustration or drawing programs, will perform better with a graphics accelerator. For such tasks, you also should consider a larger monitor with a higher resolution—a 17-inch model with 1024- by 768-pixel resolution, for example.

Multimedia applications frequently require

a sound board and a CD-ROM drive. Large and complex Windows applications (such as desktop publishing or other applications that are both text and graphics intensive) can deplete RAM severely and quickly use storage space on your hard disk. In this situation, you may want to add memory, increasing your total to 6MB or 8MB, and also install a disk-compression utility, such as Stac Electronics' Stacker or DOS 6's DoubleSpace. These will help you get the most out of the room on your storage device.

Total System Needs

The system you have today may meet many of these requirements, and you may get by if you simply install more RAM and add a graphics accelerator board and monitor with higher resolution. Or, you may need a new system altogether.

Try to buy what you can afford and also what you need now. Don't worry about whether your needs may change in a few years. If history is any indication, system prices will continue to drop. So if all you need is a VGA monitor today, don't worry about Super VGA. In two years, if your needs change, you might very well want to replace your entire system.

Whatever it is that you set out to buy, be on the lookout for quality of construction, ease of installation, high-quality documentation, and reliable service and support. ■

TIP GIVE YOUR DOS APPLICATIONS MORE MEMORY

You must start certain memory-resident programs, also called TSRs (terminate-and-stay-resident programs), before starting Windows to ensure that those programs are available to the Windows programs that need them. To avoid having such TSRs take memory that your DOS programs need, you may create a batch file called WINSTART.BAT. Windows runs this batch file when it starts up, executing it after the Windows logo appears but before Program Manager appears. When you run a program from WINSTART.BAT, it is available to Windows programs, but not to DOS programs. This prevents the Windows TSRs from stealing memory from your DOS programs.

—Kay Yarbrough Nelson

A TOURIST'S GUIDE To Windows

The first step to using Windows productively is
understanding its language.

by Kay Yarborough Nelson

FEELING LOST IN THE AMAZING VOCABULARY OF THE WINDOWS WORLD? Sometimes just reading the signposts is as confusing as trying to figure out where you are. This guide demystifies some of Windows' mysterious language. At the same time it offers down-to-earth tips on finding your way around and getting things done.

❑ When you first start Windows, you are in Program Manager, which runs in the background while you work. To exit from Windows, you exit from Program Manager. You use Program Manager to start programs. When you first install Windows, Windows sets up the programs it finds on your hard disk as groups on the desktop.

Because you probably don't have any Windows programs on your disk when you first install Windows, the groups are those that come with Windows, such as Accessories and Main.

In Program Manager, small icons represent programs, groups of programs, documents, and desk accessories such as Calendar and Notepad. You access groups and run programs with a mouse or the keyboard.

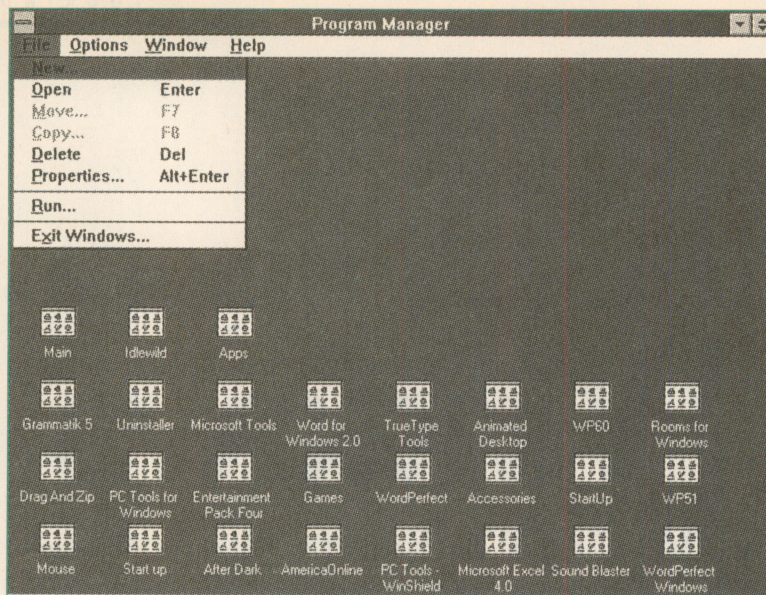
Using a Mouse

The mouse has three main functions, all of

which involve moving a pointer around the screen:

- You select an item by moving the pointer to an icon and clicking the left mouse button once.
- You open an item by moving the pointer to an icon and clicking the left mouse button twice (double-clicking).
- You move an item to another part of the screen by moving the pointer to an icon and holding the left mouse button down to drag the

Program Manager. When you first install Windows, Program Manager often includes only the Main, Games, Accessories, and StartUp groups. You add groups as you put programs on your hard drive.



icon. This technique lets you rearrange icons or move them from one group to another.

- You also may start programs and print documents in File Manager using a technique called dragging and dropping, which you accomplish by clicking on an icon, holding down the left mouse button while dragging the icon to another icon, and releasing the mouse button to drop the first icon on the second one.

Program Manager's Groups

Program Manager has a few basic groups, no matter what else you have on your hard disk:

- The Main group holds a set of programs that, among other things, let you go to DOS, set up Windows, print, and manage your filing system.
- The Accessories group contains a set of small programs, including a simple word processor, a calendar, a calculator, a painting program, and a sound recorder. (See "Not Just Window Dressing" on page 49 for more details about these applications.)
- The StartUp group holds the programs you want to run whenever you start Windows. Normally, StartUp is empty until you drag the icons of those programs to it.
- The Games group has a couple of games that come with Windows; these are handy for long, rainy afternoons.

Menus and Dialog Boxes

As the figure "Program Manager" shows, the Program Manager screen has a menu bar at the top. This bar, which lies directly below the Program Manager bar, lists the menu head-

ings File, Options, Window, and Help. When you click on one of the menu items, you open a pull-down menu of choices. You also may open a menu by pressing Alt and typing the underlined letter in the menu heading; for example, pressing Alt-F pulls down the File menu.

When you display a menu, you may make a selection by dragging the mouse to the item you want or by typing the underlined letter. Pressing the Esc key exits you from a menu without making any selections.

If you click on a choice followed by ellipses (...), a dialog box such as the one in the figure "A Dialog Box" appears. Dialog boxes let you supply additional information the program needs. To move in a dialog box, press Tab to move clockwise or Shift-Tab to move counterclockwise. To back out of a dialog box without making any choices, press Esc.

Some dialog boxes (and windows, too) have scroll bars. The figure "Parts of a Window" depicts the scroll bar that appears in Program Manager's Help window. To scroll through a list that has upward- and downward-pointing stepping arrows, repeatedly click on one of the arrows, drag the scroll box, or press the PgUp and PgDn keys.

If you see an underlined downward-pointing arrow, such as the one shown next to the label "Name:" in the figure "A Dialog Box," you may click on the arrow to pop up a list of items from which to choose.

Dialog boxes have several different kinds of controls. Command buttons, such as OK and Cancel, are square. If a command button has a bold outline around it, you may press Enter to select that command. If a selection lacks a bold outline, that choice is not available.

A set of triangular up- and down-arrows indicates that you may change a setting by clicking on the arrows. Check boxes may be on or off. When they are off, they are empty; when they are on, they contain an X. When Windows or a Windows application presents you with a group of check boxes, you may check all, some, or none of the boxes. Option buttons are round; you may select only one option button within a group at a time.

The easiest way to make choices in dialog boxes is with the mouse.

MANIPULATING WINDOWS

If you want to work in Windows you must master the basics of opening, closing, moving, resizing, and arranging windows.

Opening and Closing Windows

To open an icon into a window, double-click on it. You also may highlight it and press Enter. To close a window quickly, double-click on its control icon, the box in the top left corner of the icon. From the keyboard, press Ctrl-F4. If you try to close the Program Manager window, you'll exit from Windows. This is a neat shortcut if that's what you're ready to do.

Moving Windows

The easiest way to move a window is to drag it by its title bar—the shaded area at the top of the window in the figure “Parts of a Window.” Click with the mouse in the title bar and, still holding down the left mouse button, drag the window where you want it.

If you don't have a mouse, you may move a document window around by pressing Alt-Hyphen to open the Control menu. Use the cursor keys to highlight the Move option and press Enter; then use the arrow keys to reposition the moving tool and press Enter when the

window is where you want it. If you're working with an application window, you may open the Control menu by pressing Alt-Spacebar.

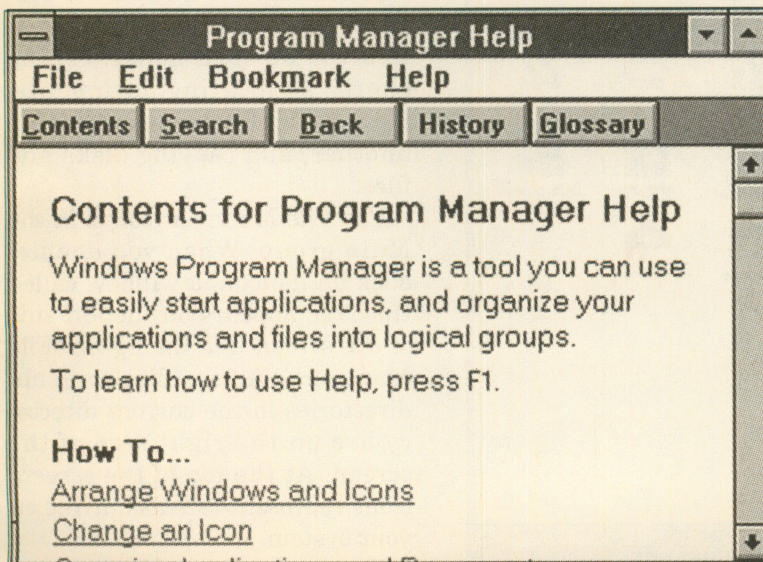
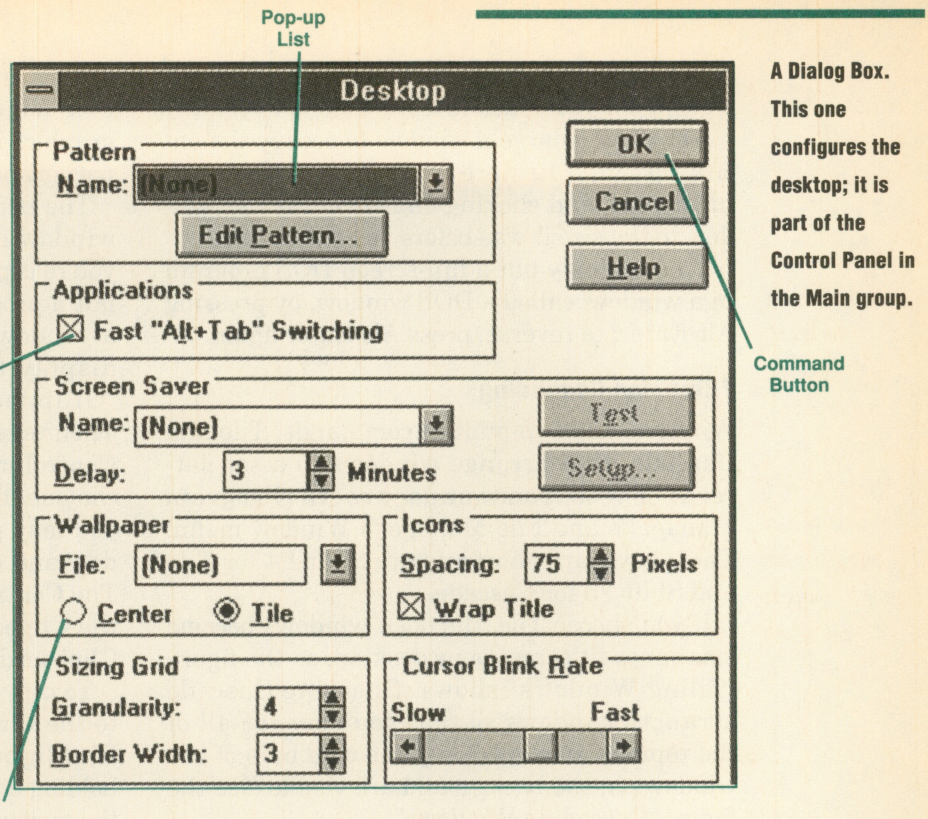
Resizing Windows

Resizing windows is another basic skill. To make a window larger or smaller, position the mouse on one of its borders. The pointer changes to a two-headed arrow. Press the left mouse button and drag the border inward to make the window smaller or outward to make it bigger. To enlarge or shrink a window in two directions at once, position the pointer on a corner and drag.

The procedure is far less efficient without a mouse. First, use the Control menu's Size command; then use the right- and left-arrow keys to resize the window. Press Enter when the window is the correct size.

Maximizing and Minimizing Windows

The Maximize and Minimize icons in the upper-right corner of a window let you shrink a window to an icon or enlarge it to full-screen size. You may reopen a minimized window by double-clicking on it.



Parts of a Window. You can maximize, minimize, and scroll through Program Manager's Help window.

A minimized program still resides in memory, waiting for you to activate it.

After you enlarge a window to occupy the entire screen, a Restore icon replaces the Maximize icon, and clicking on it restores the window to the size it was before you enlarged it.

You also may put a full-screen DOS program in a window, called a DOS window, by pressing Alt-Enter; to reverse, press Alt-Enter again.

Tiling and Cascading

Windows has two built-in commands, Tile and Cascade, that arrange windows in a set pattern. These commands are in Program Manager's and File Manager's Window menu. Their keyboard shortcuts are Shift-F4 for Tile and Shift-F5 for Cascade.

If you choose Tile, the open windows become smaller to fit across your desktop, as the figure "Tiling Windows" shows. Choosing Cascade arranges windows so that you may see all of the topmost window. Only the title bars of the windows in the background are visible (see the figure "Cascading Windows").

CUTTING, PASTING, AND COPYING

Windows lets you cut, paste, and copy text, data, and graphics from one program to another. When you cut or copy something in Windows, it goes to a special buffer called the Clipboard. From there, you may paste it into a completely different program from the one that's running. You may even use the Clipboard to copy between non-Windows pro-

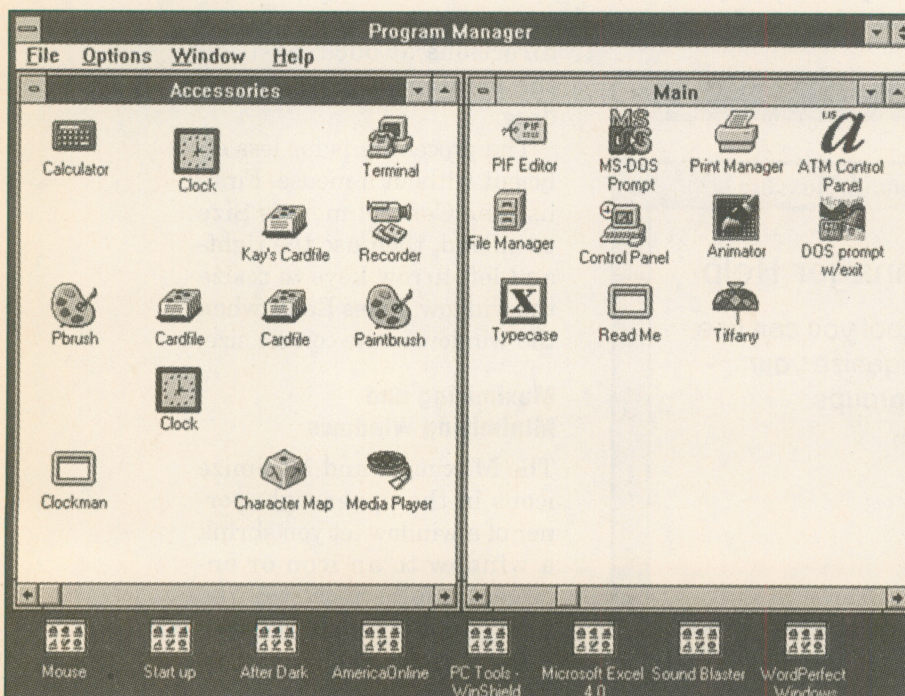
grams, but you can't cut information from a non-Windows program, and you can't paste graphics into a DOS program that doesn't support graphics.

The trick to copying and pasting into a DOS window is to make sure that the application you're copying from is running in a window. To put a program that is running full-screen into a window, press Alt-Enter; you should see a display that resembles that in the figure "Grammatik Running in a DOS Window." Then press Alt-Spacebar to open the window's Control menu; this Control menu differs from the one discussed earlier. (To save keystrokes, you may press Alt-Spacebar to create the window and open the Control menu in one step.) The Control menu lets you paste material from the Clipboard or mark text to be copied to the Clipboard.

To copy text from a non-Windows application to the Clipboard, choose Edit and then Mark. Highlight the material you want to copy by holding down the left mouse button and moving the mouse; with the keyboard, use the Shift key in combination with the arrow keys. To transfer the highlighted information to the Clipboard, press Enter or click the right mouse button.

Then go to the program into which you wish to insert the material. If it's a DOS program, put it in a window by pressing Alt-Enter, open the window's Control menu, choose Edit, and choose Paste. If you're transferring information to a Windows program, you may press Ctrl-V to paste the information.

Tiling Windows.
Windows fits
your open
windows across
the desktop.

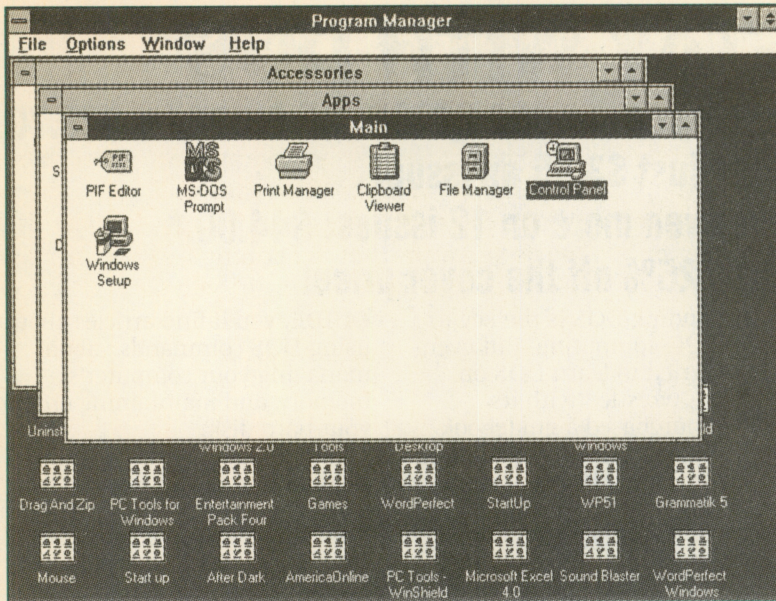


FILE MANAGER

File Manager is a separate program from Program Manager. It lets you do such housekeeping chores as locating documents, moving files from one directory to another, and copying disks and files.

The File Manager icon is in the Main group. When you double-click on its icon, a window called the Tree appears on the left side of the screen (see the figure "File Manager"). All the files and sub-directories in the current directory are on the right side of the screen. At the top of the screen, icons represent the disk drives on your system.

You may choose whether you want to look at the directory tree,



Cascading Windows. Windows arranges your open windows so that the title bars of all open windows show. Move from one window to another by clicking on any part of the appropriate window.

just the files in the directory, or both. Choose Tree Only from the View menu to see just your directory structure. Use the Tree menu to delve into your directory system. You may expand and collapse directories to see what's in them. Highlighting a directory and choosing Expand Branch, for example, shows any subdirectories that are in that branch. To see your entire directory structure, choose Expand All from the Tree menu.

Use the File menu to copy, move, delete, and rename files and directories; create new directories; and run programs. The File Menu also has a Search command, which helps you find files, and an Associate option, which lets you tell Windows to associate files with a particular extension to a certain program. You then can run the program by double-clicking on the data file.

You may, for example, give documents created in WordPerfect 5.1, which doesn't assign a particular extension to its files, an extension such as WPD and associate that extension with WordPerfect. Thereafter, when you double-click on a file with a WPD extension, Windows automatically runs WordPerfect and loads the file.

Windows automatically associ-

ates some file extensions with the programs that created them. For example, INI files (initialization files, which contain settings for Windows itself, as well as other Windows programs) are associated with the Windows Notepad, which is a simple ASCII editor.

The Disk menu lets you copy and format disks. It even has a Quick Format command. If you have Windows, do your disk copying from here. It's much faster than using DOS's DISKCOPY command. Don't bother to return to DOS for formatting disks, either.

Directory Windows

When you expand a branch of your directory tree and then click on a directory in the branch, Windows displays a directory window such as the one on the right side of the figure "File Manager." The files preceded by icons that look like tiny windows—they have little bars across the top—are program files. You may start a file of this type by dou-

TIP PLAY SOUNDS WITHOUT A SOUND CARD

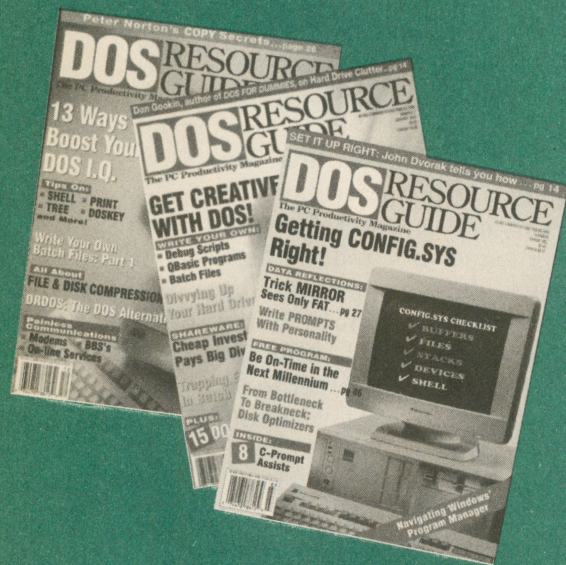
The second-most frequent question new Windows users ask is, "How can I get Windows to play sounds?" You may install a sound card, but if you merely want Windows to play its four sounds—a ding, ta-da, chimes, and a chord—all you need is a program called the PC Speaker driver.

If you have access to CompuServe, you may get this program easily. After logging on, type GO MSL and then browse for a program named SPEAK; it's in the WDL library. After you download and decompress the file (it's self-extracting, so just type SPEAK), copy the decompressed files OEMSETUP.INF and SPEAKER.DRV to your \WINDOWS directory. Read SPEAKER.TXT and AUDIO.TXT for more information. If you're not on CompuServe, you may order the driver from Microsoft (206-642-7676).

To add the PC speaker driver to Windows' list of installed drivers, select the Drivers icon in Control Panel (in the Main group) and choose the Add button. In the List of Drivers box, select Add Unlisted Or Updated Driver, and choose OK. A dialog box appears. Type in the names of the drive and directory where you copied OEMSETUP.INF and SPEAKER.DRV, then select OK. Select SPEAKER.DRV from the dialog box that appears and choose OK. Pick settings for the new driver that don't conflict with those for your other devices and select OK. To activate the newly installed driver choose the Restart Now button.

—Kay Yarborough Nelson

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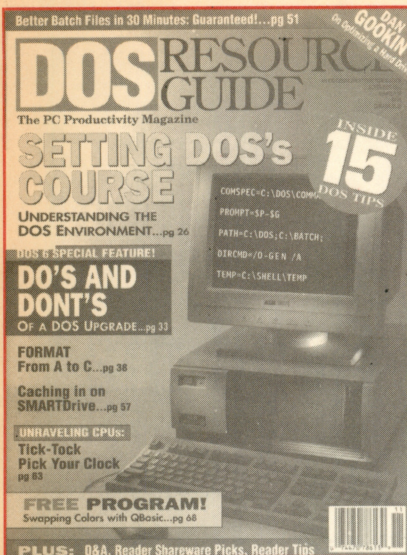
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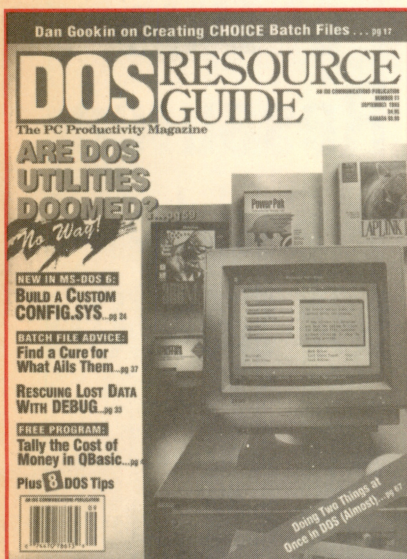
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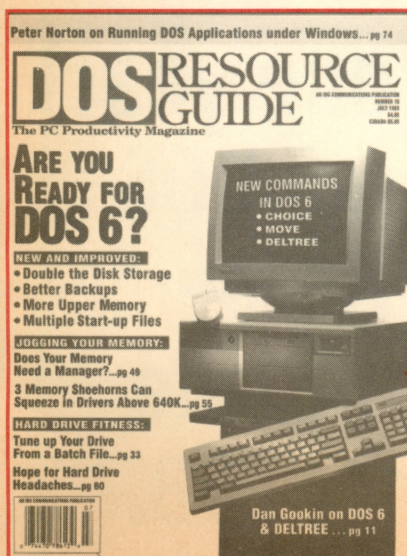
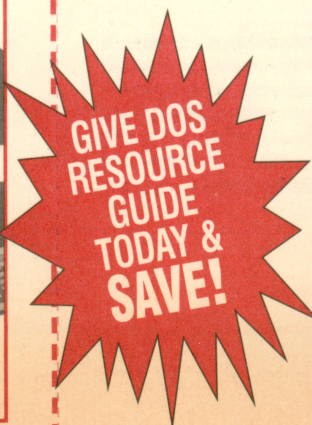
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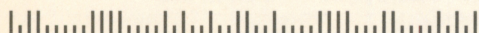
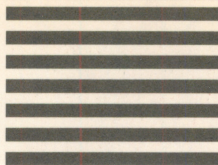
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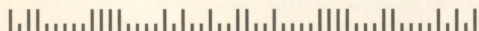
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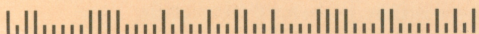
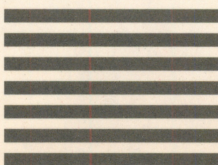
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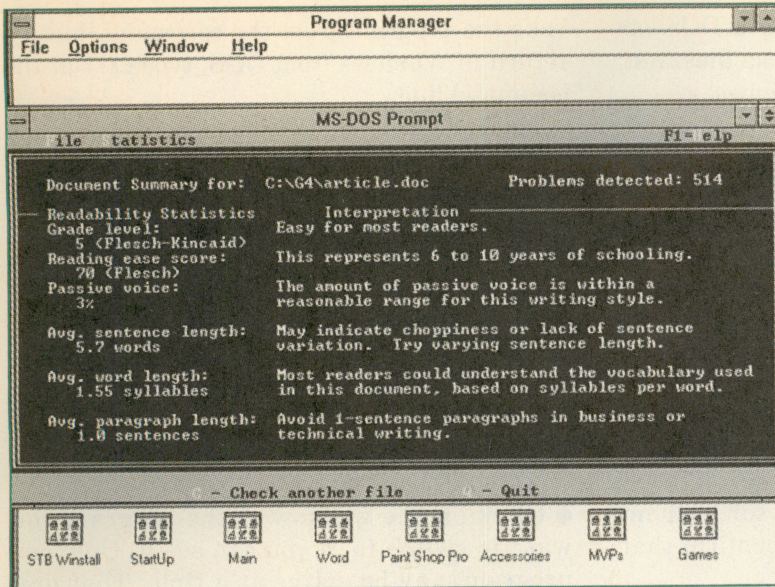
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Grammatik Running in a DOS Window. When a program runs in a window, you may use the Clipboard to copy to other applications. For example, the readability statistics could be copied to the Clipboard and then pasted into a word processor.

ble-clicking on its icon. Icons with lines inside them are files associated with a program. If you double-click on one of them, you'll start the program and open the document.

File Manager lets you open as many directories as you like, but it normally shows you only one. If you need to see more than one directory at a time, use this technique: Display the first directory **in a window**; then open another window by pressing the Shift key while double-clicking on the directory into which you want to look next. Then tile the windows by pressing Shift-F4. To display a **third** directory, do a Shift-double-click on the appropriate directory name and press Shift-F4. This isn't really a trick; it's almost a necessity for getting around in File Manager.

You may minimize a directory window to get it out of your way temporarily. If you want to see a list of the directory windows you have open and switch to one of them, use the Window menu.

Selecting Files

Selecting files in File Manager—perhaps because you want to copy them to another disk—is another

special Windows skill. It's accomplished most efficiently using a mouse and the keyboard.

To select files that are next to each other, click on the first one; then press and hold down the Shift key and click on the next one. To select files that aren't next to each other, press Ctrl and click on the files. To go straight to a certain part of the alphabet in a file list, just type the first letter of the filename.

Using the keyboard alone, selecting files is a little more complicated: Press Shift-F8, use the arrow keys to move the selection box that you'll see on the screen, and use the spacebar to select files.

Copying, Moving, and Deleting Files

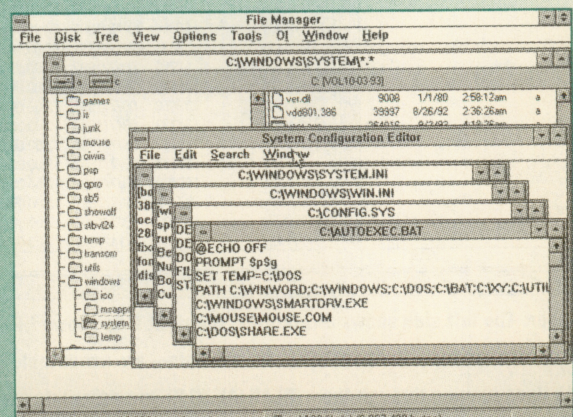
File Manager lets you use keyboard shortcuts or the mouse to copy, move, and delete files. Use F7 for Move and F8 for Copy if you want to spec-

TIP GET TO KNOW WINDOWS' SYSTEM EDITOR

Windows has a built-in System Editor that displays four important system files at once—AUTOEXEC.BAT, CONFIG.SYS, WIN.INI, and SYSTEM.INI—letting you edit them with the click of your mouse. To start System Editor, choose Run from the File menu in Program Manager or File Manager, type SYSEDIT, and press Enter. SYSEDIT displays the four files on screen, cascading them one behind the other. To view all four at once, open the Window menu and select the Tile option (see the figure). Click on the title bar of the file on which you want to work. SYSEDIT automatically creates backup copies of the original files, giving them the extension SYD.

—Kay Yarborough Nelson

Windows' System Editor, SYSEDIT, automatically loads AUTOEXEC.BAT, CONFIG.SYS, WIN.INI, and SYSTEM.INI. If you then choose the Window menu's Tile option, you may edit these files quickly and easily.



ify the files to act on with wildcards, as DOS lets you do. To use the mouse, select the files first; then use one of the following techniques:

- To move or copy files to a different disk, say to a floppy disk in drive A, drag them to the tiny drive icon at the top of the File Manager window.
- To copy files to the same disk, press Ctrl and then drag them to the appropriate drive icon.
- To move files to the same disk, drag them to the appropriate drive icon.
- To move files to a different disk, press Alt and then drag them to the appropriate drive icon.
- To delete files and directories, select them and press Del. You are asked to confirm that this is really what you want to do.

STARTING PROGRAMS

You have several ways to start programs in Windows. Here are a few of the simplest:

- If the program has an icon in a Program Manager group, just double-click on its icon.
- In File Manager, double-click on its name.
- In Program Manager or File Manager, open the File menu, select Run, and supply the path and name of the program you want to run.
- To run DOS programs, you may go to DOS (double-click on the MS-DOS Prompt icon in the Program Manager's Main group) and in-

voke the program from the command line. To return to Windows from DOS, type EXIT at the command line.

If a program stops responding to the keyboard or mouse, press Ctrl-Alt-Del. This won't restart your computer the way it used to; it shuts down the offending program and lets you return to Windows.

Switching Between Programs

If you start several programs, you may switch between them in a number of ways. Here are some of the simplest:

- Click on the window of the program you want to switch to, if you can see it. Only one program may be active at a time. That program is in the active window—the one with a dark title bar.
- Press Ctrl-Esc or double-click on the desktop to bring up the Task List, which lists all the programs that are running. Then switch to the program you want by double-clicking on its name.
- Press Alt-Esc or Alt-Tab to cycle among the programs you've got running.

After you learn your way around in Windows, you may want to learn how to define hot keys that let you switch between programs, but that procedure lies beyond the scope of this simple introduction.

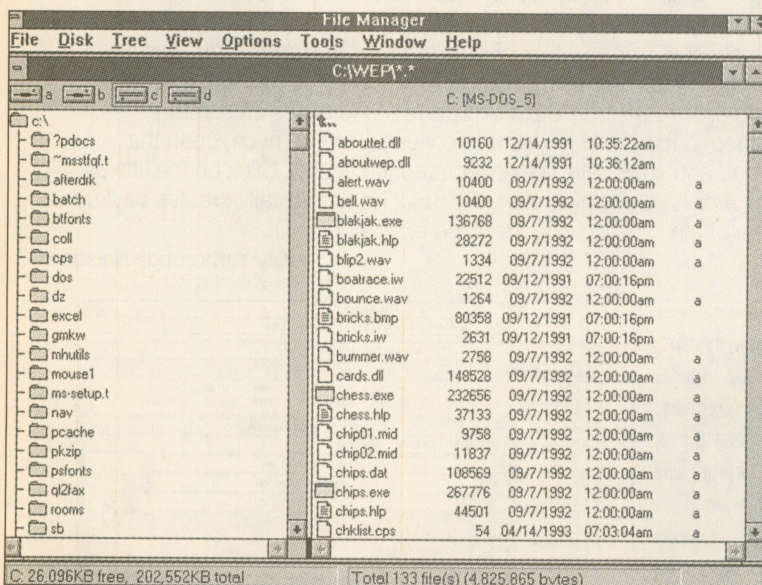
EXITING

To exit from a program, use the method that that program normally uses. To exit from Windows itself, exit from the Program Manager in any of these ways:

- Double-click on the Control box in the upper-left corner of Program Manager's window.
- Press Alt-F4 when the Program Manager is active.
- Bring up the Task List (Ctrl-Esc), select Program Manager, and choose End Task.

JUST THE BEGINNING

You'll find other terms: point-and-click directory deletion, task switching, the Clipboard, and multitasking. As for the strange vocabulary, my advice is to get used to it, because double-click, dialog box, and scroll bar are just the start. If you have a future in Windows, there's an alphabet soup of new terms and acronyms in your future. ■



File Manager. The left side shows directories; the right side shows files. File icons with bars across the top—BLAKJAK.EXE, for example—are executable files. File icons with lines running through them (BLAKJAK.HLP) are associated with a file. In this case, BLAKJAK.HLP is associated with BLAKJAK.EXE, and clicking on BLAKJAK.HLP runs BLAKJAK.EXE and opens BLAKJAK.HLP.

DOING DOS Under Windows

**It takes time and know-how to run DOS sessions under Windows,
but the rewards far outweigh the frustrations.**

by Hardin Brothers

OLD HABITS DIE HARD. I FIRST INSTALLED WINDOWS 3.0 ON MY COMPUTER when I needed to review a Windows application. I wasn't impressed; I'd test a few features of the program and then return to my friendly DOS word processor to write about it. But one day, I discovered the power of the MS-DOS Icon in the Windows Program Manager, and since that day I've never looked back. I now spend at least 60 percent of my computing time running DOS programs under Windows, and I wouldn't have it any other way. □ Diehard DOS fans may think I'm crazy, and loyal Windowists probably share that view. But I find too many

reasons to run DOS programs and batch files under Windows, and too few drawbacks to change my computing habits. The most important advantages of my present mode of operation are that it lets me perform task switching and multitasking, gives me access to the Windows Clipboard for transferring graphics and text between programs, and protects my system against crashes. The only drawbacks are the time it takes to get Windows and DOS programs working together gracefully and the frustrations you endure while trying to achieve

that aim. (For general setup advice, see the sidebar "Do's and Don'ts of Running DOS under Windows.")

The Advantages

If you aren't used to running DOS applications from Windows, you may not appreciate just how much flexibility you have to gain by using this approach. Before I fill you in on that score, I should acknowledge that running DESQview from Quarterdeck Office Systems affords the same general advantages as running DOS un-

Hardin Brothers has been working with and writing about computers for 14 years. He is a Technical Editor of *DOS Resource Guide*.

DO'S AND DON'TS OF RUNNING DOS UNDER WINDOWS

- DO experiment to find the best general PIF settings for your system and then save them in _DEFAULT.PIF.
- DO change the Program Properties of the PIF Editor so that the command line reads PIFEDIT.EXE _DEFAULT.PIF.
- DO write two or more PIFs for a program if you want to run it in different modes or with different options.
- DO start batch files from a PIF if you need to change directories, set up data files, or perform other preliminary tasks.
- DO write a PIF file for each important DOS batch file that you want to run from Windows.
- DO run the same DOS program (or the MS-DOS prompt) two or more times if it will help to have several sessions open at once.
- DO use the Control menu to switch multitasking on and off.
- DON'T use CHKDSK in its fix mode (CHKDSK /F) in a DOS

session that is running under Windows.

- DON'T use SUBST when you install Windows.
- DON'T use ASSIGN, BACKUP, CHKDSK, DISKCOMP, DISKCOPY, FASTOPEN, FDISK, JOIN, LABEL, RECOVER, RESTORE, or SYS when Windows is running.
- DON'T issue a FORMAT command for drive C, or any other hard disk, when Windows is running.
- DON'T run DOS-based disk defragmenters and similar low-level utilities when Windows is running
- DON'T turn off your computer or reboot until you exit from all DOS programs, return to Windows, and exit from Windows back to a plain DOS prompt.

—H.B.

der Windows. I choose to use Windows instead of DESQview because I enjoy using a wide range of Windows applications.

The first advantage that Windows provides is the ability to do task switching. I can have two, three, four, or more DOS applications (plus several Windows applications) open at the same time. Just by pressing a couple of keys, I can leave one program and run another. The other open programs are suspended unless I switch into one of them.

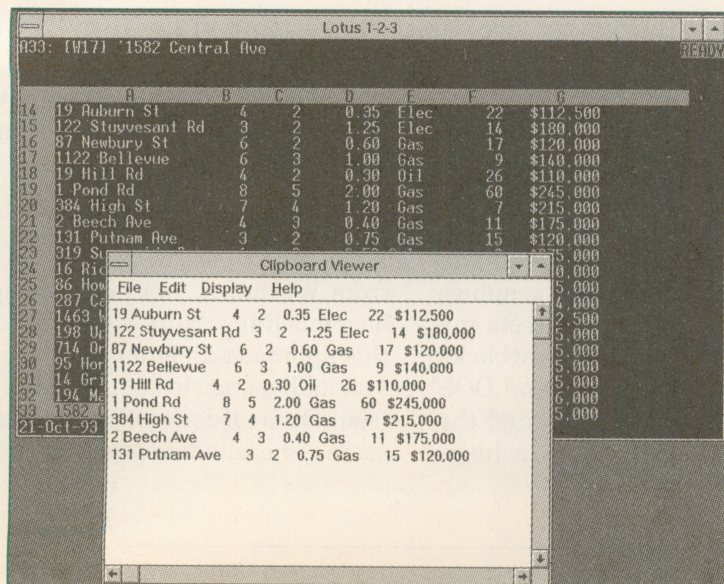
For example, right now I'm writing this document in a DOS word processor. I also have a DOS database manager, a DOS shell and file manager, and a DOS prompt open. Each is running full-screen, but by pressing the right key combination, I can shrink one of the programs to a window on the Windows desktop. And I also can switch among the programs

with a simple keystroke. The important point is that I don't have to exit from one program to start another, as I would have to do from the DOS prompt.

The second advantage is that multitasking is available whenever I choose to use it. If I need to print a large document with my DOS word processor, for example, I can let the printing go on in the background while I turn my attention to other work in other applications. I can download a file from CompuServe, for example, and, once I make a connection, I can work with my database or spreadsheet, or even play a game. The printing and the downloading continue while I do something else. At times, I feel as if I have a room full of computers, each busy with a special task. Why should I sit and wait for my computer?

The third advantage is the Clipboard, a hidden part of Windows that lets you transfer text and graphics between programs (see Figure 1). With the Clipboard handy, it's child's play to grab a group of cells out of a DOS spreadsheet, for example, and transfer them into a DOS word processor. (For step-by-step instructions on how to perform this simple process, see the sidebar "Copying Data with the Windows Clipboard.") And I often lift text from a word processing document and send it through my modem without first saving it in a separate text file. The Clipboard even lets you transfer graphics between programs or

Figure 1.
The Windows Clipboard lets you grab parts of a DOS program file and copy it into another file. Here, the Clipboard contains part of a Lotus 1-2-3 spreadsheet.



capture a DOS screen and insert it in a Windows application.

Finally, Windows 3.1 offers a great deal of crash protection. If a program enters an endless loop or tries to run amok, Windows lets you terminate the errant program without affecting other programs that are running. If programs never crash on your system, this feature may not matter to you. But as a programmer, I often crash my system when developing a new program. I appreciate not having to go through an entire reboot when I do.

Setting Up DOS

To run DOS applications efficiently under Windows, you must do a bit of preliminary work. The first, and most important, step is making sure that your computer has sufficient resources. Ideally, you should have a 386 or higher computer with a goodly complement of RAM and hard disk space (see the article "Investing in New Hardware" on page 13 for an in-depth discussion of Windows' hardware requirements). Make sure that you are using DOS 5 or later and Windows 3.1. Windows doesn't get along as well with earlier versions of DOS, and Windows 3.1 is much less likely to cause you headaches than version 3.0. If you don't already have a mouse, buy one. Many DOS-based applications are easier to run with a mouse, and although Windows doesn't require a mouse, it's much easier to use if you have one.

Second, make sure that you leave as much conventional memory (memory below 640K) free as possible before you start Windows. To accomplish this, you need DOS's HIMEM.SYS memory manager or an equivalent program, such as QEMM from Quarterdeck or 386Max from Qualitas. Use the appropriate commands—DEVICEHIGH and LOADHIGH if you're using HIMEM.SYS—to put as many of your device drivers and memory-resident utilities into high memory as possible. If you have some that don't fit, consider setting up batch files that load these memory-resident programs when you start DOS applications that need them.

Also, you may be better off running certain pop-up programs in a separate DOS window, rather than trying to squeeze them into upper memory. A scheduling program, for example,

takes up less room and is easier to update, if it has a window of its own.

Finally, make sure that you include a SHARE command in your AUTOEXEC.BAT file. This keeps programs from writing to the same file at the same time, which can cause massive data destruction.

Windows and PIFs

Windows 3.1 runs in two modes: Standard (286 mode) and Enhanced (386 mode). Standard mode, which is the only mode available on a 286 computer, doesn't permit you to multitask DOS programs. It also is less efficient at handling the memory needs of DOS programs than is Enhanced mode. On the other hand, Standard mode can run some DOS programs about 10 percent faster than Enhanced mode can.

All-in-all, I find that the advantages of Enhanced mode outweigh its disadvantages, at

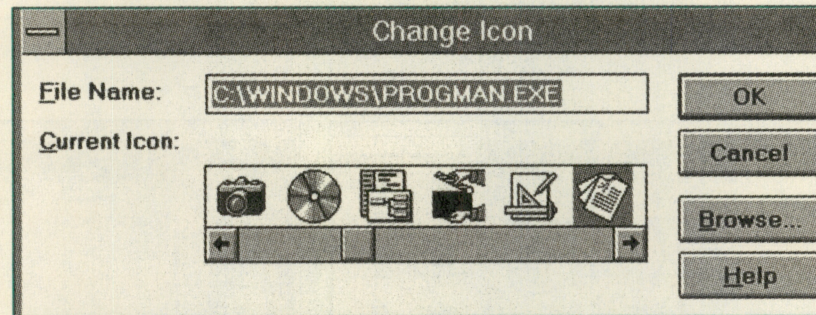


Figure 2. Some DOS programs come with their own Windows icons. For the ones that don't, choose an icon from **PROGMAN.EXE** or **MORICONS.DLL**. Select File/Properties/Change Icon from the Program Manager.

least on most machines. If you have a 286, you have to use Standard mode; if you have a 16- or 25-MHz 386, you may want to improve your programs' operations by running in Standard mode. Otherwise, try Enhanced mode.

To force Windows to start in Standard mode, use a `WIN /2` or `WIN /S` command. To force Windows to start in Enhanced mode, the command is `WIN /3`. If you leave out the `/2` or `/3` switch, Windows starts in the mode that it considers correct for your computer: Standard on a 286 and Enhanced on a machine with a 386 or higher processor.

The next step is creating a Program Information File (PIF) for each DOS application that you want to run from Windows. If you don't have a PIF for a DOS application (or if you run the DOS program without using the PIF), Windows uses a PIF called `_DEFAULT` to determine how it should set up DOS and memory.

The easiest way to set up a PIF is to let Windows do it for you. The Windows Setup program, which you use to install Windows

COPYING DATA WITH THE WINDOWS CLIPBOARD

Copying data from one DOS program to another is simple. The trick is to put the DOS programs into their own windows. This lets you mark the data, copy it to the Windows Clipboard, and copy it from the Clipboard into the second program.

Here's how you would copy a portion of a spreadsheet file into a word processing file. This example uses Lotus 1-2-3 and Xywrite, but the process is identical for any other DOS programs:

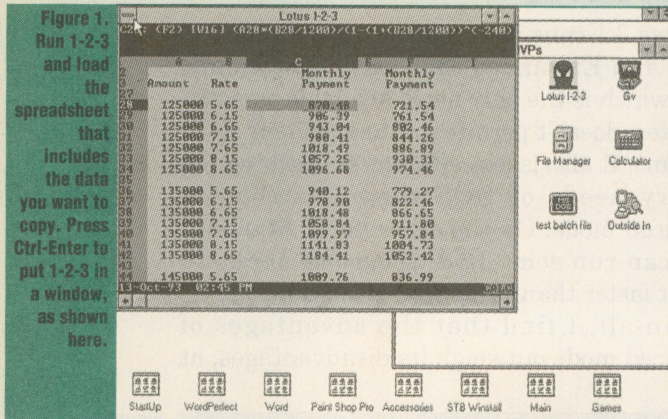


Figure 1. Run 1-2-3 and load the spreadsheet that includes the data you want to copy. Press Ctrl-Enter to put 1-2-3 in a window, as shown here.

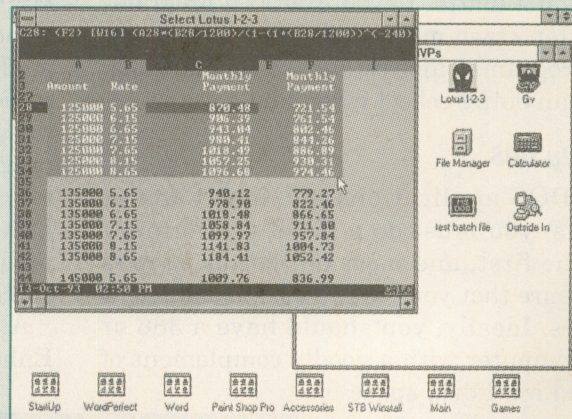


Figure 4. Next, click on the Mark option. Both menu boxes disappear. Pressing the mouse button, move the mouse across the area you want to copy (here, rows 2-3 and 27-34), which becomes highlighted.

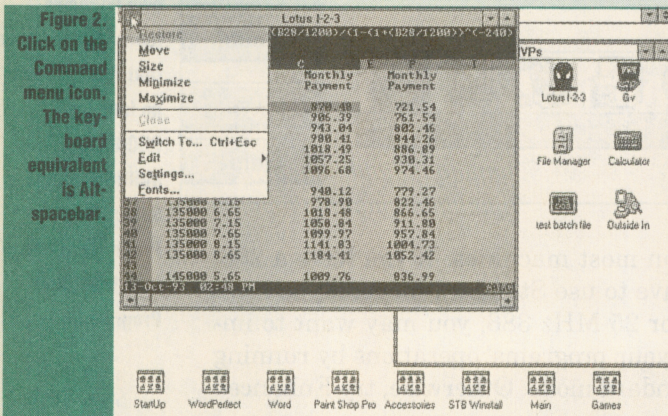


Figure 2. Click on the Move menu icon. The keyboard equivalent is Alt-spacebar.

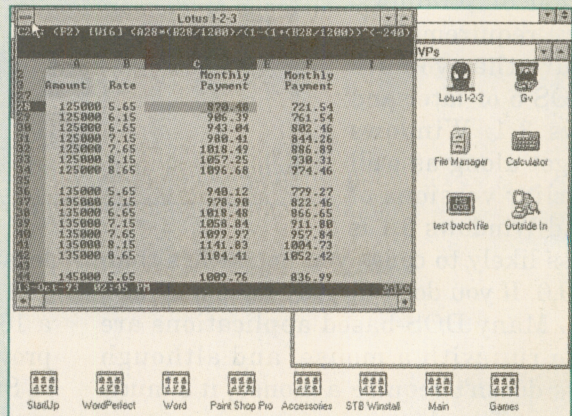


Figure 5. Press the right mouse button. This saves the marked block to the Clipboard. The highlight disappears.

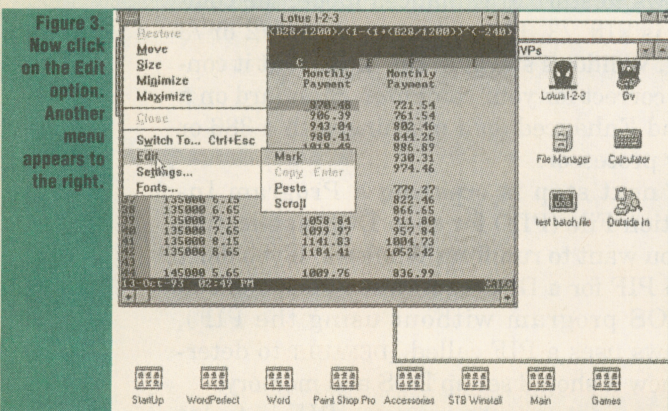


Figure 3. Now click on the Edit option. Another menu appears to the right.

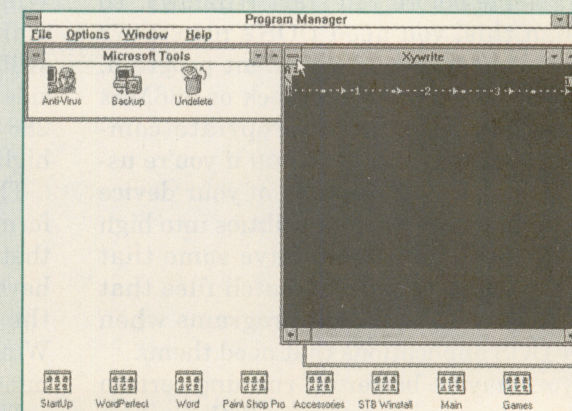


Figure 6. Return to Program Manager and start Xywrite. Load the file into which you want to copy the 1-2-3 data. Press Ctrl-Enter to put the DOS program into a window.

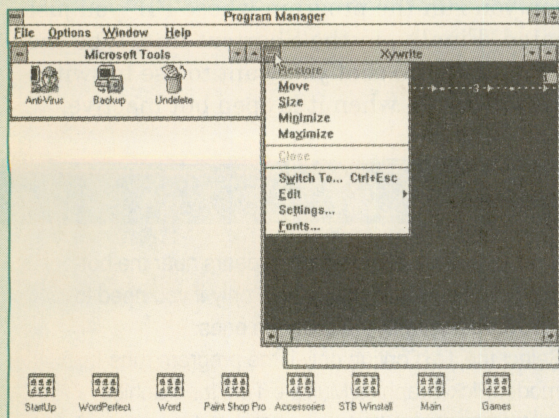


Figure 7. As you did with 1-2-3, click on the Command menu icon. The keyboard equivalent is Alt-spacebar.

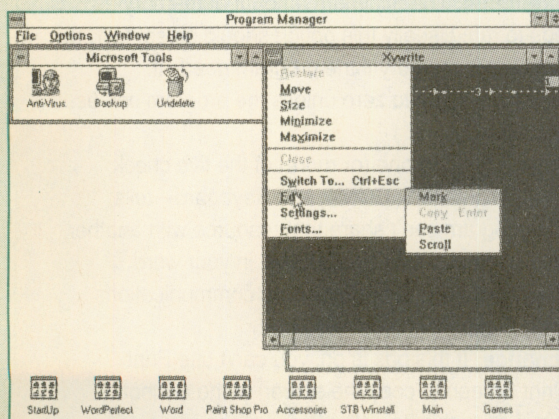


Figure 8. Click on the Edit option. Another menu appears to the right. Instead of clicking on the Mark option as you did in 1-2-3, click on the Paste option.

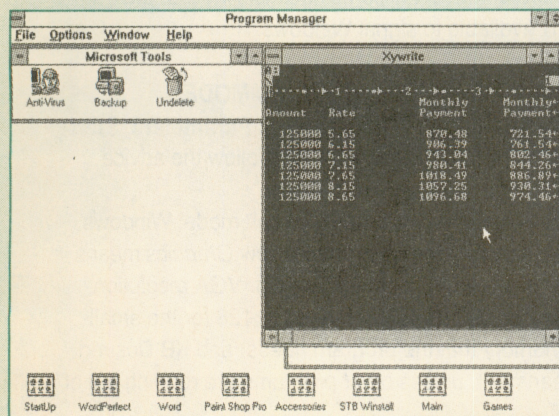


Figure 9. Both menu boxes disappear. The data you marked in 1-2-3 is copied from the Clipboard into the file.

and which you may run from Windows itself, has an option for setting PIF files and icons for the DOS applications on your hard disk. Windows creates a PIF file for each application that it recognizes, using information stored in a file called APPS.INF in the /WINDOWS/SYSTEM directory. You may read that file to create your own PIFs, but it is easier to let Windows do the initial work and then fine-tune the resulting PIF as necessary.

To create or fine-tune a PIF file, you must use the PIF editor, one of the small utilities shipped with Windows. Although it looks intimidating at first, the PIF editor is easy to use. To bring up an existing PIF for editing, choose the File menu's Open option and select a PIF from the list. The PIF editor's context-sensitive help makes it easy to get your bearings. The message displayed in the bottom bar changes as you move the cursor and click on various buttons. When you press F1 for help, the help pertains to the field where the cursor is positioned.

PIF files aren't stored in ASCII format, which means that you must use the PIF editor to create and change them. Also, unless you always run Windows in the same mode, you should enter information for both Standard and Enhanced mode in every PIF. To do this, select the Mode entry in the menu bar and click OK when you see the warning message that tells you to change to the other mode.

The PIF editor displays a single entry page in Standard mode and two pages for Enhanced mode. The sidebar "PIF Settings" explains what each PIF option does and how you should set it.

After you create a PIF for a DOS application, you probably want to ensure that you can launch the program by clicking on an icon. Setting up the icon is easy. With Program Manager running as the top window, click once on any icon in the Program group in which you want to store the icon. It doesn't matter to Program Manager

which group you choose; you may create as many or as few groups as make sense to you.

Clicking once tells Program Manager to highlight the title of the icon you picked. It also highlights the name of the group, which is what you want. Now pick File/New from the Program Manager menu. A dialog box will ask whether you want to create a new item or a new group; you want a new item.

Next, you'll see a dialog box called Program Item Properties. The first line, Description, is where you type the text that you want displayed

beneath the icon. The second item, Command Line, is the command that you want to use to launch the program from DOS. Include any command-line switches or options that you need. The third line, Working Directory, overrides the line of the same name in the PIF file. Type in the name of the directory that you want to be the default directory when you run the program whose PIF you just created. Finally, in the Shortcut line, type the key combination that you want to use to switch to this program when it is open but inactive.

PIF SETTINGS

When you create or edit a program information file, or PIF, Windows presents you with a series of screens and asks you to fill in the appropriate fields and check the correct boxes. The following explanations will help you make the right choices, even if you're new to running DOS under Windows.

PIF OPTIONS FOR STANDARD MODE

Program Filename: The name (including the full path) of the COM, EXE, or BAT file that you want to run.

Window Title: The title that will appear on the window's title bar and under the program's icon.

Optional Parameters: The command-line parameters that you want to pass to the program when it starts. If you enter a question mark, Windows prompts you for parameters each time it launches the program. You may select different parameters for starting up in Standard and Enhanced mode.

Start-up Directory: The default directory when the program starts. If you enter anything here, you may not be able to associate a file extension with the PIF.

Close Window on Exit: This entry, which appears near the bottom of the window, should remain unchecked only if you need to see text on the DOS screen after the program ends.

Video mode: Select the Text option only if the program runs entirely in text mode. Pick Graphics/Multiple Text for graphics programs and for text programs that use multiple "video pages." You may have to experiment to determine which setting is appropriate.

Memory Requirements: The minimum amount of memory an application needs to run. Usually this option should be set to 128; Windows provides more memory if the program needs it.

XMS Memory: Set this value to zero unless the program can use extended memory (XMS).

Directly Modifies: Checking one (or more) of the five check boxes—COM1, COM2, COM3, COM4, and Keyboard—tells Windows that the program can't share that resource with another program. If, for example, you checked COM1 in your word processor's PIF, you couldn't task switch to a communications program that used that port.

No Screen Exchange: If this box is on, you can't use Print Screen or Alt-Print Screen to copy the screen to the Clipboard.

No Save Screen: Leave this box off unless you need a few more bytes of RAM to load the program.

Reserve Shortcut Keys: Leave this box off unless the program needs one or more of these key combinations. Any that are "reserved" aren't available to signal Windows.

PIF OPTIONS FOR ENHANCED MODE

Program Filename, Window Title, Optional Parameters, Start-up Directory, and Close Window on Exit: Follow the advice provided in the Standard mode explanations.

Video Memory: Select the program's "normal" mode; Windows gives it more memory if it changes modes. *Low Graphics* means CGA resolution. *High Graphics* means EGA or VGA resolution.

Memory Requirements: Set KB Required to 128 (or the smallest amount of memory that the program needs) and KB Desired to -1 (which means *all*), unless other programs are running out of memory.

EMS Memory and XMS Memory: Set both the required and

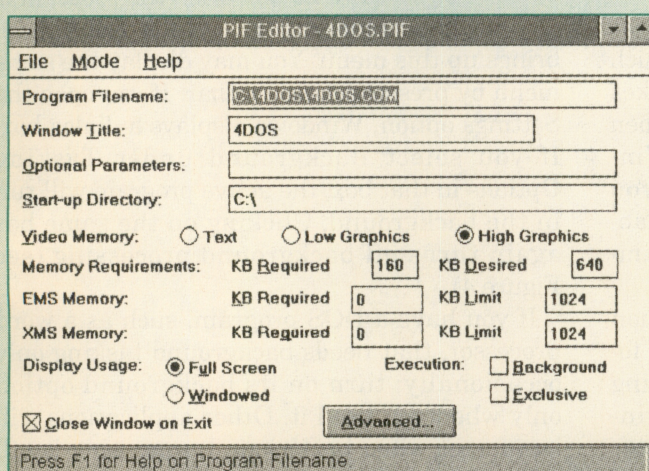
The opening PIF screen in Standard mode for the program 4DOS.

Because Standard mode does not permit multitasking, there is no Advanced Options screen.

If you click on the Change Icon button, you may select an icon for the program. If the program has its own icon (many DOS applications now do), you may type in the name of its ICO file. Otherwise, you can pick from one of the icons in PROGMAN.EXE (see Figure 2), which you'll see by default, or type MORICONS.DLL into the file area and see another group of icons from which you may choose. If you don't like the icons and icon editor included with Windows, check out the many shareware and commercial collections on the market.

Making the Switch

If you intend to run a variety of DOS programs under Windows and switch among them efficiently, you must learn a few new key combinations. The most important is Alt-Tab-Tab, which you execute by holding down the Alt key and pressing Tab one or more times. As you press Tab, Windows cycles through its list of open applications, both Windows programs and DOS programs. When the name of the program that you want to switch to appears in the title bar, release both keys and that program



The opening PIF screen for 4DOS running in Enhanced mode.

desired amount of memory to zero, unless the program can use expanded or extended memory. Setting an upper limit instead of -1 (all the program asks for) speeds up operation a bit.

Display Usage: Select the Full Screen option, unless you know the program both starts and runs well in a window.

Execution: Leave the Background option off unless the program does something useful in the background. Leave the Foreground option off unless you want to halt all Windows and DOS applications when this program runs in a full screen.

ADVANCED PIF OPTIONS FOR ENHANCED MODE

Multitasking Options: Background priority is ignored if the Execution: Background option in the previous screen is off. Otherwise, set the value to 100, unless the program needs more time to do its background work. Set foreground priority to 10000 if you want the application to run as fast as possible, unless applications running in the background need more time. Turn Detect Idle Time on, unless the program always needs to run in the background (if it uses a timer, for example). Turn Detect Idle Time off if the program is Windows aware and therefore sends a message to Windows when it doesn't need any more time.

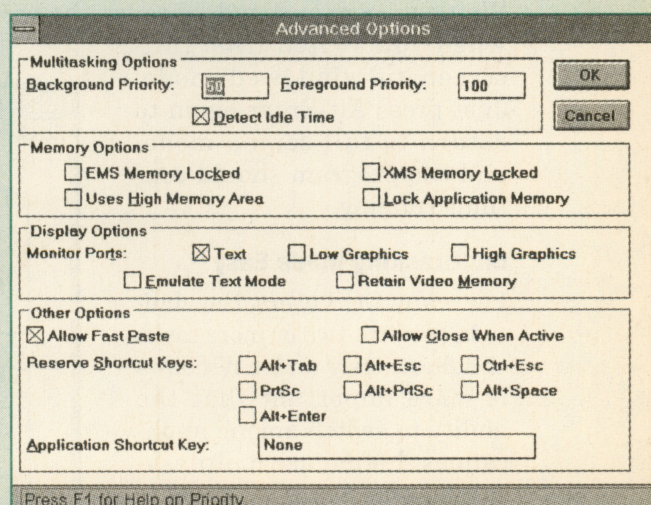
Memory Options: Normally, leave all options in this box off. Check the Uses High Memory Area box, if the program uses the

high memory area. Turn on the locks one at a time if the program crashes. Be aware that each lock steals memory from other applications.

Display Options: Leave all Monitor Ports off unless you are using an EGA monitor, or if the program's screen is garbled. Leave Emulate Text Mode off unless the cursor or text is garbled when you switch back to the program. And leave Retain Video Mode off unless you run out of memory when the program switches to graphics mode.

Other Options: Turn on Allow Fast Paste unless the program loses text because the Clipboard "types" too fast. Allow Close When Active should be on if the program writes to files. Turn it off if the PIF is for the DOS prompt or a program that doesn't write to files. Don't reserve any shortcut keys unless the application needs them internally.

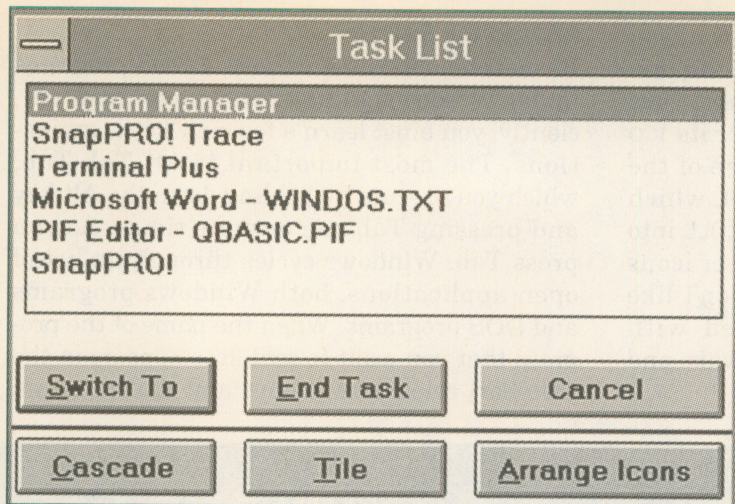
—H.B.



The Advanced Options screen in Enhanced mode, which sets the program's multitasking options.

Figure 3.

When you're running more than one program at the same time, you can move among them with Task List, which you pop up with Ctrl-Esc. Task List also lets you cascade or tile the active programs, putting them all on the desktop at the



same time. will run in the foreground. Related keys, which may not be as useful, are Alt-Esc, which takes you to the "next" program in the stack of open programs, and Ctrl-Esc, which pops up Windows' Task List (see Figure 3) and lets you choose a program from a list of names. Alt-Tab is by far the most powerful of the program-change key combinations.

The second most important key combination is Alt-Enter. When a DOS program has the focus (when it is accepting keystrokes), pressing Alt-Enter toggles it from full-screen to windowed mode. Many DOS programs run faster in full-screen mode, but you'll need windowed mode if you want to see two or more programs at once, or if you want to use the Windows Clipboard to transfer text or graphics from one program to another. If you're working with a graphics mode program that has a high screen resolution and heavy memory requirements, Windows may suspend or pause the program when you switch from full-screen to windowed mode. Just press Alt-Enter again to return to full-screen mode, and the program should continue running.

Multitasking Made Easy

For many DOS users, the ability to perform two or more tasks simultaneously under Windows is more important than the ability to switch among applications. I often use multitasking when I want to print a large file from my DOS word processor, because Windows lets me do the printing in the

background and run another program in the foreground. I don't have to waste time waiting for the printing to finish so that I can get back to work.

But multitasking makes heavy demands on your hardware, so it's important to be able to change easily from working on a single task to working on multiple tasks, or vice versa. The Control menu puts you in charge. Clicking once on an icon for a DOS program, or clicking on the Control button on the left side of the title bar when the program is running in windowed mode,

brings up this menu. You may display the same menu by pressing Alt-Spacebar. If you open the Settings option, Windows displays a dialog box. If you select Background under Tasking Options in that box, the active program will run in the background. Clicking on the same box again turns off background processing (see Figure 4).

If you have a DOS program, such as a word processor, that needs background tasking only occasionally, turn on its background option only when you need it. Other applications will run faster when background processing is off.

The Control menu opens up other possibilities, as well. If you're running your system in windowed 386 Enhanced mode, and if your video driver has the correct support, you may change the fonts used for a DOS text application, which also changes the size of its window. Select the Fonts option, then select the appropriate point size (see Figure 5). Pick a size that lets you read

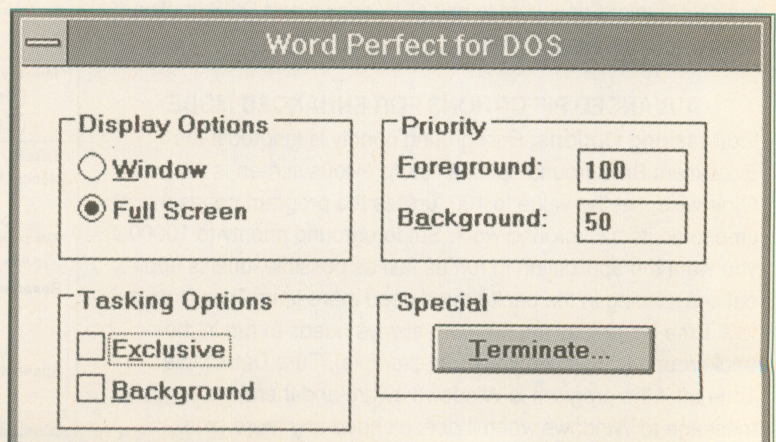


Figure 4. For a DOS program that you want to run in the background only occasionally, you can change the background setting on the fly. Choose Settings from the Control menu and select Background under Tasking Options.

the entire DOS-screen window but still gives you access to other Windows icons.

Effecting a Transfer

Another benefit that Windows offers DOS users is that it makes exchanging information simple. To copy text or graphics from a DOS application, you have two choices. You may press the Print Screen key to capture everything that appears on the monitor or press Alt-Print Screen to capture the active window. If you are working in text mode, the ASCII text is placed on the Clipboard; if you are working in a graphics mode, Windows captures a bit map. You may select a smaller portion of the screen by bringing up the Control menu and selecting Edit and Mark. Use the mouse or cursor keys to outline the portion of the window you want to capture and then press Enter.

You may paste text from the Clipboard into a text-based DOS application, such as a word processor, nearly as easily. First, move the cursor to the location where you want to place the text. Then, from the Control menu, select Paste. Windows "types" the text stored in the Clipboard into the destination document.

It's a little more difficult to move graphics from the Windows Clipboard into a DOS application. Some DOS programs, such as Microsoft Word, know how to capture graphics from the Windows Clipboard. But with most programs, you must paste the Clipboard into a Windows application such as Paintbrush, save it using a file format that your DOS program understands, and then import the file into the DOS program.

You're in Good Hands

The last important feature that DOS programs gain under Windows, especially in 386 Enhanced mode, is crash protection. If a program stops responding to the system, and you press Ctrl-Alt-Del to restart your computer, Windows intercedes and displays a warning message. You then have the option of ignoring the Ctrl-Alt-Del, terminating the program, or rebooting the system. If you pressed the keys on

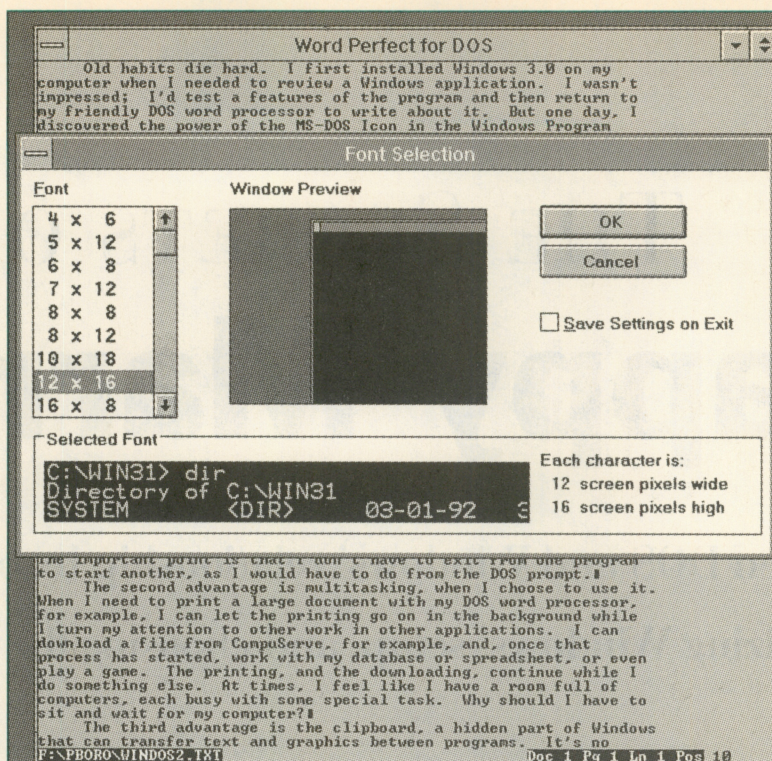


Figure 5. The Font option on the Control menu lets you change the type size of your DOS programs. The Selected Font box lets you preview how the new size will look.

purpose, you'll probably pick the second option. If you suspect that an interaction between programs, or between Windows and your application, caused the problem, save the data files that each running program opened, leave Windows, and then reboot your computer. But if you think that you simply ran into a program bug, you may continue working with other applications as if nothing had happened.

If you have trouble running a DOS program under Windows or difficulty setting up a PIF correctly, you have three options. First, contact the developers of the program. They probably can tell you how to make things work correctly. If that fails, try Microsoft's Technical Support. Or, you may buy one of the many books that walk you through the procedures. The one I like best is *Windows 3.1 Secrets* by Brian Livingston (IDG Books Worldwide Inc., 1992).

Pamper Yourself

Running DOS programs under Windows is a luxury, a pleasure that I refuse to do without. Before I tried it, I heard other users talk about how much they liked task switching and multitasking. At first, I couldn't imagine why I'd want two or more programs running at once, but now I'm a convert. Unless I have to use one of the "forbidden" programs that you should never run under Windows, I rarely work from the DOS prompt any more. ■

THE SECRETS OF A Happy Marriage

Strengthen DOS and Windows' relationship by optimizing memory, customizing Windows' setup, and choosing the right PIF settings.

by Brian Livingston

WINDOWS AND DOS GO TOGETHER LIKE A BRIDE AND GROOM. IN OTHER words, Windows 3.1 can't run without the DOS operating system, while DOS and the programs written to run under it can benefit from the improving influence of Windows. So it's only natural that PC users want to combine both DOS and Windows programs on their systems. □ But although Windows is one of the most popular programs ever sold for the PC-compatible market, it also is one of the most complex. The Windows disks contain more than 450 files. Only a fraction of these—the base files and device drivers your system needs—are copied to your hard disk

during installation. However, all of the files that are transferred from the Windows disks need to operate perfectly, or you will experience odd behavior from your Windows and DOS applications.

Entire books—including three written by me—have been devoted to configuring and exploiting Windows. This article boils that wealth of information down to the core points you must understand to ensure that DOS and Windows will live happily ever after on your system.

STEP 1:

CONFIGURE YOUR MEMORY CAREFULLY

For most people, the biggest change in store when they install Windows on top of DOS lies in rethinking their system's memory-allocation strategy. Because PC compatibles started out with a limited, 640K memory space, different sorts of memory sprouted up to fill the gap.

There are four basic kinds of memory that

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DOS and Windows use: Conventional, Upper Memory Blocks (UMBs), Extended, and Expanded memory.

- Conventional memory is the first 640K installed on your system board.
- UMBs are memory locations in the 384K above conventional memory. These locations are filled with code for read-only memory (ROM) chips and add-in RAM boards, and with terminate-and-stay-resident (TSR) programs that are relocated from conventional memory into UMBs.
- Extended memory is all memory installed on your system board after the first 640K. It starts at the 1,024K line and is counted upward from that point. The first 64K of extended memory is a special area called the high memory area (HMA), which is used by DOS 5 and higher and by Windows.
- Expanded memory usually is memory that is installed on an add-in memory board. No matter how much RAM is on an expanded memory board, it is always accessed by your PC through a "page frame" located somewhere below the 1,024K line.

The basic truth about these different kinds of memory is that DOS programs usually use only conventional and expanded memory. In contrast, Windows uses only conventional and extended memory. On a 386 PC with at least 2MB of RAM, Windows can run in its so-called 386 Enhanced mode and can convert extended memory into expanded memory as it is needed. Therefore, my most important recommendation on configuring memory for DOS and Windows, if you have a system with a 386 or higher processor, is: Change any expanded memory your system has into extended memory.

If you must run DOS programs outside of Windows and these programs require expanded memory, you may provide this by loading EMM386.EXE, which comes with Windows 3.1, or another third-party expanded memory manager, such as Quarterdeck Office Systems' QEMM, Qualitas' 386Max, or Helix Software's NetRoom. If you already have installed Windows, and you still have boards providing expanded memory, you should be able to change their settings to convert the boards to

extended memory. (Consult your DOS manual or the documentation that came with the product you're using for assistance in making expanded memory available outside of Windows.) Your goal should be to get at least 4MB of extended memory in which Windows can run. 6MB is preferable, and more is recommended if you use memory-hungry programs.

STEP 2:

PERFORM A CUSTOMIZED WINDOWS INSTALLATION

If Windows already is running successfully on your system, you may skip to Step 3 or read this section to see what you might have missed!

My biggest tip for installing Windows is that you always should choose Setup's Custom Setup option rather than Express Setup. Custom Setup lets you choose whether or not to install several large files that can eat up disk space fast, such as "wallpaper" graphics (which I find take more space than they're worth).

More importantly, by default Express Setup claims for a "swap" file approximately half of the free disk space on the drive containing Windows. This is a lot more than you need.

The swap file is used by Windows when no space remains in RAM. When you launch a program, but no memory is available, Windows switches another program from memory into the swap file on disk. This process is called swapping, and the total amount of physical RAM and swap file space is called virtual memory. Virtual memory makes Windows appear to have use of more RAM than is installed in your system. But swapping is very slow, because it takes longer to access a hard disk than to access RAM, and it makes the Windows environment seem sluggish when it is utilized.

For this reason, I recommend that you limit the size of your swap file to 4,096K or less. If you have 6MB or more of RAM, use a 1,024K swap file. If you have just 2MB to 4MB of RAM, use a 4,096K swap file. (You may select this size when you install Windows using the Custom Setup option.) If you have installed

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A FIRST-AID KIT FOR WINDOWS

What do you do when Windows won't run or crashes and burns with regularity? Well, with the following checklist in hand, you can take steps to eliminate everyday DOS and Windows conflicts. My suggestions are listed in order, from the easiest to the most complex. If trouble crops up, try the simple solutions first, attempting more elaborate troubleshooting techniques only if the easy fixes don't work.

1. Use WIN /B to track Windows' start-up proceedings.

When you install Windows 3.1, it creates a file called BOOTLOG.TXT. This ASCII text file contains a record of all the programs Windows requires to load successfully.

If Windows doesn't load properly—especially if it hangs after displaying the Microsoft logo screen—you may create your own BOOTLOG.TXT to find out why.

To do this, type the following commands at a DOS prompt to change to your \WINDOWS directory and rename any existing file named BOOTLOG.TXT as BOOTLOG.001:

```
C:
CD \WINDOWS
REN BOOTLOG.TXT BOOTLOG.001
```

(If your Windows directory has a name other than C:\WINDOWS, use the appropriate drive and directory in the above commands.)

Next, start Windows by typing the following command:

```
WIN /B
```

Even if Windows hangs when you start it, this command writes a file called BOOTLOG.TXT to your \WINDOWS directory. Read this file with a DOS text editor, such as EDIT or EDLIN. You may see a line such as the following in the file:

```
LOADFAIL=GDI.EXE FAILURE CODE IS 02
```

If so, you've found the cause of the problem. The meanings of—and solutions to—the most common error codes are listed in the table "Common Bootup Problems."

If you need to reinstall a damaged Windows file, use the EXPAND.EXE program to decompress it and then copy the file over the damaged one. For example, to reinstall GDI.EXE, use a command line such as this one to expand the compressed file, GDI.EX_:

```
EXPAND A:\GDI.EX_ C:\WINDOWS\SYSTEM\GDI.EXE
```

2. Use WIN /D:X to uncover possible memory conflicts.

If Windows crashes after you start it, or it exhibits erratic behavior, a conflict may exist between Windows and a memory-resident program (also called a TSR) that uses your sys-

tem's Upper Memory Blocks (UMBs). If you use Windows in 386 Enhanced mode, the fastest way to detect whether you have a conflict is to start Windows with this command:

```
WIN /D:X
```

The /D switch puts Windows into its debugging mode, while the X forces Windows to prohibit the use of UMBs.

If this command line makes your problem go away, Windows probably is trying to use a portion of a UMB that a memory-resident program or device also is using.

To resolve the issue so that you can use the UMBs, you must find the exact location of the conflict by using the MSD utility included with Windows. To do this, type MSD at the DOS prompt. (MSD does not give accurate results when run in a DOS session within Windows.) When the MSD screen appears, press your M key to display a memory map of your system.

MSD creates a chart showing each 16K block of upper memory. The first one shown is at address C000-C3FF hexadecimal, the second one is C400-C7FF hex, and so on. The final block is at FC00-FFFF hex. Look for blocks that are marked RAM, ROM, or Used UMBs. This means that these addresses are used by an add-in board's RAM or ROM chips, or by a TSR's program code. Write down the addresses of areas used for these purposes. Then, in your \WINDOWS directory, open SYSTEM.INI with a text editor such as EDIT or EDLIN. Search for a section labeled [386Enh], and add a line to exclude each block of memory used by an add-in board or TSR. The following lines, for example, exclude three different portions of upper memory:

```
[386Enh]
EMMEXCLUDE=C000-C3FF
EMMEXCLUDE=C400-C7FF
EMMEXCLUDE=CC00-CFFF
```

Save the SYSTEM.INI file, then restart Windows. If your problem goes away, one of the lines in SYSTEM.INI is successfully keeping Windows away from an area of memory conflict. If you like, you may take out the lines and add them back one at a time to find out which one solves the problem, leaving only this line in SYSTEM.INI.

3. Use Dr. Watson to uncover the cause of Windows error messages.

Windows 3.1 includes another free utility: DRWATSON.EXE. If Windows often displays General Protection Error or Application Error dialog boxes, Dr. Watson may be helpful. To use the program, open WIN.INI with a text editor (such as Windows' Notepad), search for a section labeled [Dr. Watson], and edit the lines following the heading to read:


```
SkipInfo=time
ShowInfo=disassembly errorlog
```

If your WIN.INI doesn't include this section, add three lines at the end of the file:

```
[Dr. Watson]
SkipInfo=time
ShowInfo=disassembly errorlog
```

When WINI.INI includes these lines, Dr. Watson doesn't write the date and time to a file every time you start Windows; instead it writes error-logging information to the file.

Save your changes to WIN.INI, then create an icon for Dr. Watson in Program Manager's StartUp. To do so, select the New option in Program Manager's File menu, then select Program Item and click OK. Type DRWATSON.EXE in the Command Line box and click OK. Program Manager creates an icon for Dr. Watson automatically.

When you restart Windows, a Dr.

Watson icon should appear on your icon line. You can't find out what sort of problems exist by opening a window for Dr. Watson. Instead, after a general protection error or application error occurs, you should check out \WINDOWS\DRWATSON.LOG, the file in which Dr. Watson writes information about the error. You may open this ASCII text file with any text editor. In the first three lines, you'll see a message such as this one:

```
MYAPP had a 'Exceed Segment Bounds (Read)' fault
at program 15:0bbf.
```

This tells you which application had problems, MYAPP, and the location of the instruction the application, *program*, was running at the time. Although this won't make the problem go away, it will help the vendor of the affected application to figure out what the problem is and produce an updated program version that eliminates the difficulty.

4. Use PIFs and the PIF editor to eliminate conflicts.

If you're having trouble running DOS programs under Windows, you should follow the main article's recommenda-

tions on setting up PIFs for your DOS applications. If DOS applications crash or act strangely, take the following additional steps, in this order:

- Use the PIF Editor to make a PIF for the DOS program, and turn on the Exclusive setting. This gives the program all the CPU's processing time, suspending Windows while the DOS program is running.
- In the Advanced dialog box of the PIF Editor, turn on the following boxes: Lock Application Memory, EMS Memory Locked, XMS Memory Locked, and Retain Video Memory. This keeps the DOS program's memory allocation from being "borrowed" by any Windows programs, which can cause erratic behavior.
- In the Advanced dialog box, turn on all the Reserve Shortcut

Keys boxes, such as Alt+Tab. This makes it impossible to switch from the DOS application back to Windows until you exit the DOS program. But it also may enable the application to run, because Windows no longer gets in the way.

COMMON BOOTUP PROBLEMS

Code	Cause	Solution
zero or 8	Out of memory	Add memory
2	File not found	Reinstall the file
3	Directory not found	Make sure the directory exists
5 or 6	Link failed to file	Reinstall the file
10	Incorrect version	Reinstall Windows
11 or 14	Invalid EXE file	Reinstall the file
12	OS/2 application	Use a Windows application

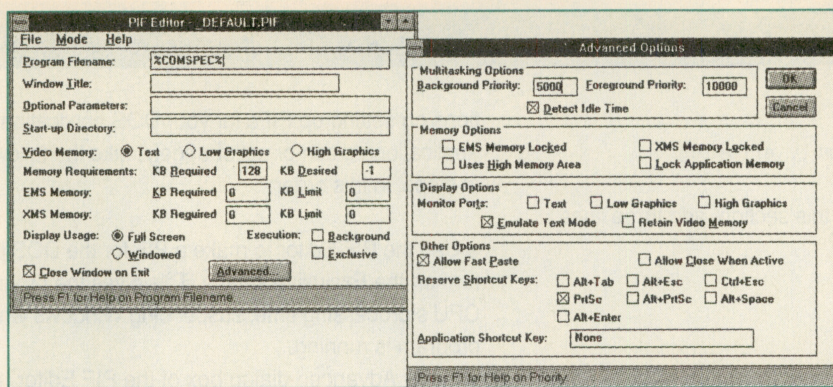
5. Use Microsoft's technical support system.

If all else fails, you may have to contact Microsoft directly. If you have a modem, the best way to do this is through the CompuServe Information Service (800-848-8990 or 617-457-8650), an electronic bulletin board system (BBS) that Microsoft monitors constantly. After you log on to the service, type G0 MICROSOFT and follow the prompts to get into Microsoft's DOS or Windows message forum. Read the introductory material, then post a message to the account number of a system operator (sysop) listed in the forum. The more specific you can be in the description of your problem, the better the answer you'll get. Call again after 24 hours to read messages left for you.

If you don't have a modem, and you live in the United States, you may call Microsoft's voice line for technical telephone support (900-896-9000). But you'll have to pay \$2 per minute or a maximum of \$25 per call. If you live outside the United States, call 206-882-8080 to get the proper number for your area. Microsoft is phasing out its 206-637-7098 telephone support line.

—B.L.

Recommended PIF Settings. In Windows' 386 Enhanced mode, the PIF Editor provides two dialog boxes and numerous options for configuring your DOS applications to run under Windows.



(Continued from page 37)

Windows already, you may open the Control Panel's 386 Enhanced dialog box—if you're in Enhanced mode at the time—to select the size. In the 386 Enhanced dialog box, select the Virtual Memory button and then the Change button to access your swap file's settings.

This dialog box gives you three options: Permanent, Temporary, or None. A permanent swap file is available only to Windows; DOS and Windows applications can't use it. A temporary swap file is created when Windows starts and deleted when you quit Windows, so its disk space becomes available to DOS applications when Windows is not running. Consequently, whether you choose one or the other comes down to whether you need the extra disk space when Windows isn't running. A permanent swap file is a bit faster than a temporary swap file, but the difference is hard to detect in everyday use.

I recommend that you always have at least a 1,024K swap file, because Windows performs faster when its virtual memory features are enabled. (For this reason, it doesn't make sense to check the None option.) You probably are better off with a permanent swap file, because it will be there when you need it. If you decide to create a temporary swap file, keep in mind that Windows creates a smaller file—without telling you—if it doesn't see enough free disk space to create a temporary swap file of the specified size.

STEP 3:

GET THE BEST DOS PERFORMANCE UNDER WINDOWS

When you have Windows installed and running, your most important task is to change Windows' incredibly bad settings for the performance of DOS applications. (If Windows

isn't running well, consult the sidebar "A First-Aid Kit for Windows" for troubleshooting tips before going further.)

Windows' default installation settings make a variety of assumptions about the type of DOS applications you will run and how much CPU time you want to give each of them. In my experience, these settings cause most of the complaints about DOS programs running slowly under Windows.

Fortunately, you can change most of the settings with ease. Windows lets you create 545-byte files called Program Information Files (PIFs) to control each of your DOS applications. To name a PIF, you substitute the extension PIF for the program's normal extension. For example, the PIF for starting a word processor named WPROC.EXE would be WPROC.PIF. If Windows doesn't find an appropriately named PIF for a DOS program you start under Windows, it uses the settings in a file called _DEFAULT.PIF. (The first character of a PIF filename is an underline character.)

To alter these settings, you must use Windows' PIF Editor, which is available from an icon in Program Manager. The figure "Recommended PIF Settings" shows two windows of the PIF Editor and the settings I recommend for optimizing your system. If you need more information about a particular option, you may select it and press F1. The help window that appears will provide an explanation of the option on which your cursor is.

To fine-tune the default settings in _DEFAULT.PIF, go to the PIF Editor, pull down the File menu, select Open, select the appropriate directory, and choose _DEFAULT.PIF from the list of PIFs. Then, make the following changes:

Program Filename: When you open _DEFAULT.PIF, the name of the program that this PIF starts, _DEFAULT.BAT, appears in the PIF Editor's topmost box. But that's not the only item you may type in this spot: You can add an environment variable to a PIF by typing a variable name surrounded by percent (%) signs.

To do this, clear the box, and in its place type %COMSPEC%, the environment variable indicating the location of your system's command interpreter, which for most DOS users is COMMAND-

.COM. Most PC systems don't have a file called _DEFAULT.BAT, but they all have COMMAND.COM—even if the current version is not on drive C but was relocated by networking or other software. When you type %COMSPEC% to find the correct COMMAND.COM, the PIF Editor complains that this program filename doesn't have a valid EXE, COM, or BAT extension. You simply may click OK to ignore this message.

Video Memory: Leave this option set to Text. Most DOS applications that use graphics can start in text mode and switch automatically to graphics mode. Change this option to Low Graphics only if an application uses CGA graphics and can't switch successfully. Use High Graphics if the application uses EGA or VGA graphics and has problems.

Memory Requirements: Leave the KB Required box set to 128, but change the KB Desired box to -1 (a hyphen followed by the numeral 1). This value tells Windows to give the DOS application all available conventional memory. Windows even takes some memory away from Windows applications if you use this setting, which may increase the memory available to your DOS application.

The one time you might not want to change this setting to -1 for a DOS application is when the PIF controls an ordinary DOS prompt, as does the DOSPRMPT.PIF file that is represented by the MS-DOS Prompt icon in Program Manager. To conserve memory when running a mere DOS prompt, change the setting for both KB Required and KB Desired to 128. You can't launch any DOS applications in as little as 128K of memory, but you should launch such applications from their own PIF files with the proper settings, anyway. All DOS commands require fewer than 128K, so this setting doesn't restrict the repertoire of commands you may use if you run a DOS session under Windows. When you have a DOS prompt open on your screen, and you restrict it to 128K, more memory is available to other windows.

EMS and XMS Memory: These boxes control the amount of expanded memory and extended memory available to a DOS application when its PIF is in control. For _DEFAULT.PIF, I recommend

that you set both KB Required and KB Limit to zero. This helps your system's performance, because Windows doesn't need to set aside memory to manage EMS and XMS functions. If you run DOS applications that require EMS or XMS memory, create an individual PIF for each such application. In this case, use a value such as 256 for KB Required and select an appropriate setting for the program's memory limit. Using -1 tells Windows not to impose any limit.

Display Usage: DOS applications run faster when operating in a full screen, rather than in a window, so set this option to Full Screen. If you have a fast system, however, and prefer that all your DOS programs start up in a sizable window, select Windowed instead.

Background and Exclusive: I recommend that you leave both of these options off in _DEFAULT.PIF. If you have DOS programs that must run in the background or in exclusive mode, make PIFs for each of those programs. Running a DOS application in the background reduces the performance of Windows applications, if the Background box in its PIF is on. Running a DOS application with the Exclusive box on, by contrast, suspends all Windows activity in the background until you exit the DOS program. This can shut down desirable Windows functions, such as alarms, fax transmissions, e-mail handling, and so on. A better way to get good DOS performance under Windows is described in the Background and Foreground discussion below.

Background and Foreground: When you click the Advanced button in the PIF Editor's

TIP DOS 6.2 EASES DOUBLESPEACE RESTRICTIONS

With DOS 6, you couldn't run any DoubleSpace commands while Windows is running. With DOS 6.2, Microsoft eased this restriction a bit by allowing you to run two forms of the DBLSPACE command—DBLSPACE /INFO and DBLSPACE /LIST—from an MS-DOS prompt while Windows is running. Both commands simply display information about DoubleSpace without modifying your DoubleSpace setup.

DBLSPACE /INFO displays information about the current drive. To display information about another drive, follow /INFO with a drive letter, such as DBLSPACE /INFO D:.

DBLSPACE /LIST displays a map of all drives recognized by DoubleSpace. If you're not sure what compressed drives are available or what drive letters are used for your host drives, DBLSPACE /LIST is just what you need.

—Doug Lowe

386 Enhanced mode, you see an Advanced Options dialog box that lists the background and foreground priority settings for multitasking. These settings control the amount of CPU time a DOS program gets when it is reduced to an icon (when it is running in the background) and when it is running in full-screen mode (in the foreground). The settings for Background Priority and Foreground Priority may range from zero to 10,000. By default, all Windows programs have a Background setting of 50 and a Foreground setting of 100. (You may change this in the Control Panel's 386 Enhanced dialog box.) This means that if you assign a DOS program a foreground setting of 100 and you run this program under Windows, it loses about one-third of its performance when run under Windows, because the DOS application gets 100 units of time, while the Windows environment gets 50 units, which is one-third of the total of 150 units.

When you create a DOS PIF, I recommend that you try the maximum setting, 10,000, for the foreground value and that you use 5,000 for the background setting. The value 10,000 has a special meaning: It tells Windows to give

the application all available CPU time, until that application becomes idle—perhaps because it is waiting for the user to press a key. During idle moments, Windows gives a few CPU ticks to any Windows applications that need to run in the background. Of course, if 10,000 and 5,000 are too high to keep valuable Windows processes alive, lower these settings.

Memory Options: I recommend that you leave all of these options off, except if your DOS application won't run unless you "lock" some of its memory to prevent Windows from swapping the memory to disk.

Display Options: Leave these options off, too, except for the Emulate Text Mode setting. Leaving this one on lets Windows speed up the writing of text to a DOS session. Turn off this box only if a DOS program displays garbage when you run it under Windows.

Other Options: Turn off all options, except for Allow Fast Paste and PrtSc. Turn on the Allow Fast Paste box only if a DOS application can't accept text pasted from the Clipboard as fast as Windows can transfer it. The 40 option lets a DOS application print the screen to your printer when you press the Print Screen key. If you turn off this option, pressing the Print Screen key in a DOS session only copies the screen into the Clipboard, which has no way to print.

When you are finished making changes in the PIF Editor, open the File menu and select Save or Save As to preserve your changes. Usually, Windows stores PIF files in the \WINDOWS directory. But if you wish to customize your system, or you don't like writing information to this directory, you may place PIF files in any directory listed in DOS's PATH statement.

Windows offers a brilliant palette of colors and a seductive point-and-click interface, but it isn't always easy to find the best settings to run DOS applications under Windows. Fortunately, more people are learning how to make DOS and Windows coexist and, in the process, have discovered that they're made for each other. ■

TIP LEARN TO USE TASK LIST

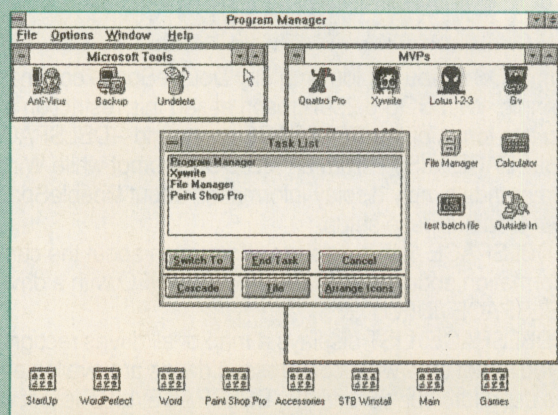
A lot of Windows users try to get by without using its Task List (see the figure), but it's really very helpful. First of all, it provides a list of everything that's running, even programs minimized into icons.

You can't bring up Task List by opening a menu and selecting an item, however. To display it, you press Ctrl-Esc or double-click on an empty area of the desktop. You double-click on an item to switch to it.

Another nice thing about Task List is that it lets you display a File Manager window within Program Manager. To do this, open File Manager, press Ctrl-Esc to bring up Task List, and select the Tile button.

—Kay Yarbrough Nelson

The Task List, which you pop up by pressing Ctrl-Esc, shows you all the programs you have loaded and lets you select the one to switch to. You may cascade or tile your programs from Task List.



EXPLORING WINDOWS' Technical Side

Take a closer look at Windows and discover what's
going on under the hood.

by Robert L. Hummel

MICROSOFT'S MS-DOS HAS GARNERED MORE THAN ITS SHARE OF detractors since its introduction in 1981. Some have complained that its arcane commands and stark interface make DOS difficult to use. Still others have lamented that complex programs have outgrown DOS's single-tasking operation and the 640K limitation imposed by the PC's architecture. Despite its failings, however, DOS has become the operating system of choice on nearly 110 million PCs. □ The strength of this installed base and the level of discontent among DOS users and developers has opened the way for another Microsoft product, the Windows operating

environment. Windows offers many features that DOS lacks: a graphical system of menus and windows, multitasking, easy transfer of information between applications, and backward compatibility with existing DOS applications.

Microsoft's documentation refers to Windows 3.1 as an operating system. Although that's not far from the truth, technically it's incorrect. From DOS's point of view, Windows is simply an application that you execute by typing WIN at the command line. But Windows clearly exhibits many of the characteristics of

an operating system, including the ability to execute applications, run several programs at the same time, and manage system resources. As a "real mode" operating system, DOS can't multitask, nor can it directly access more than 1MB of memory. All this begs the question: How can Windows do things that its operating system can't?

In this article, I attempt to satisfy your technical curiosity on this matter, briefing you on what goes on behind the scenes between DOS and Windows. I explain exactly what Windows

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is and outline some of the steps it must take to allow multitasking under DOS. I also describe how DOS and Windows divide the responsibility for talking to computer hardware when an application is executing. Finally, I point out the limitations imposed on Windows' virtual DOS sessions, the DOS-like environments in which Windows runs DOS applications.

Although I don't delve deeply enough to introduce such jargon as global descriptor tables and protected-mode segment selectors, I do mention a number of technical terms. If you're unfamiliar with the alphabet soup of memory managers and DOS and programming interfaces, see the sidebar "Extending DOS" for background information.

Initializing Windows

Windows probably is the most complex DOS application on your system. It defies a simple definition, but you can make a start if you look at it as a two-part program. The first part is its graphical user interface (GUI); the second is its DOS extender, the interface responsible for fooling Windows programs into thinking that DOS has greater versatility than it actually has. Windows' graphical menuing system is well documented, but studying its rules of operation reveals nothing about how DOS and

Windows interact. In contrast, examining Windows' DOS extender reveals not only what Windows is, but also what it must do to run in protected mode, where it can take full advantage of extended memory and perform multitasking. To grasp how Windows' DOS extender does its job, you must understand a little about how Windows loads and the steps it takes to set up a computer.

Windows' initialization begins when you execute WIN.COM. This program examines your system's configuration to determine whether Windows should start in its Standard or Enhanced mode. Standard mode is a low-performance operating mode that requires a 286 or higher processor. Standard mode provides access to extended memory and lets you switch among applications, including those not specifically designed to run under Windows.

To run Windows' Enhanced mode, your system must have a 386 or higher processor and at least 2MB of memory. Enhanced mode lets Windows take advantage of the 386's memory management tricks. If Windows is running in Enhanced mode, applications may access more memory than is physically available on your system, and you may run multiple independent DOS sessions. Unless otherwise specified, the remainder of this discussion assumes that Windows is running in Enhanced mode.

WIN.COM next determines if an extended memory manager is present in the system. Windows requires the extended memory specification (XMS) functions provided by HIMEM.SYS, a memory manager provided with DOS 5 and later, or by an equivalent memory manager, such as Qualitas's 386MAX or Quarterdeck Software's QEMM. If WIN.COM doesn't find an XMS driver but does detect extended memory, it displays a message telling you that HIMEM.SYS is missing. If no extended memory is present, Windows tells you that it can't run on your system.

Windows' next step is to make sure that it isn't already running. If you try to execute WIN.COM from File Manager or from a DOS prompt running under Windows, for example, it discovers that a copy of Windows is running and displays a message to that effect.

TIP KEEP YOUR MOUSE IN WORKING ORDER

Windows' Setup doesn't set up the mouse to work outside of Windows, and sometimes it even disables your mouse. If your mouse hasn't worked since you installed Windows, check your CONFIG.SYS and AUTOEXEC.BAT files to see whether Setup added a REM statement to the line that previously enabled the mouse. Removing the REM should solve the problem.

If the mouse is working in Windows programs but not in DOS programs running under Windows, the mouse driver probably isn't loaded before Windows starts. If you're using a Microsoft mouse or one that's compatible with it, be sure that your AUTOEXEC.BAT contains a line that invokes MOUSE.COM or that CONFIG.SYS mentions MOUSE.SYS. Also check to make sure that the line in AUTOEXEC.BAT or CONFIG.SYS lists the correct path.

After you install Windows, the most up-to-date mouse drivers are in your \WINDOWS directory, so the correct CONFIG.SYS command is:

```
DEVICE=C:\WINDOWS\MOUSE.SYS
```

If you don't find MOUSE.COM or MOUSE.SYS (perhaps because you didn't have a mouse when you installed Windows), you may use the EXPAND command to expand them from the Windows installation disks. They're named MOUSE.CO_ and MOUSE.SY_.

—Kay Yarborough Nelson

You can't run a second copy of Windows under Windows. After WIN.COM ensures it has a suitable CPU (Central Processing Unit) and memory manager and checks to make certain that Windows isn't running already, it loads WIN-386.EXE, the DOS Protected-Mode Interface (DPMI) server, which controls how Windows operates.

A DPMI server isn't a DOS extender. Instead, it provides a set of services that applications containing DOS extenders—including Windows—require to execute cooperatively on a single system. Windows' DPMI server provides basic memory management and interrupt-handling functions and performs transitions between real mode and protected mode when Windows requests it to do so. Windows' DOS extender decides when to switch modes and which program requests should be passed to DOS through the DPMI server.

WIN386 switches your PC into protected mode and passes control to the virtual machine manager (VMM). The 386 processor introduced Virtual-86 (V86) mode, a new mode of operation that permits real-mode programs to execute in a protected-mode environment. The purpose of V86 mode is to create an environment, through a combination of processor capabilities and system software, that makes a task perceive itself to be the only task executing on an 8086 processor. The creation and management of a virtual machine is the responsibility of the Windows VMM.

When the VMM gets control, it immediately creates a V86 session called the system virtual machine. For all intents, this V86 session is identical to your DOS system as it appeared before WIN386 switched to protected mode. The system virtual machine, therefore, includes all memory-resident programs and device drivers that were loaded before you ran WIN.COM. Program Manager and every other Windows application executes in this single virtual machine. The VMM then runs the WINSTART.BAT file, if it is present, to load programs that are destined only for the system virtual machine.

At this point, initialization of the DPMI server, VMM, and the system virtual machine is complete. WIN386 next loads and executes the kernel, the program module that contains the basic Windows operating system routines.

TIP GETTING LOST ICONS BACK

The question I'm asked most often by folks new to Windows is, "How do I get a lost icon back in one of my Program Manager groups?" It's easier than you think.

First, open the group into which you want to put the icon. (If you're creating a new group because you lost one, first choose New from the file menu and then choose Group to create the group.) Next, open File Manager and select the directory (on the left side of the display) that contains the file you need to turn into an icon. On the right side of the display, highlight the correct filename, then press Ctrl-Esc and Tile to put File Manager in a small window. Arrange the windows so that you may drag the file from File Manager and drop it onto the open Program Manager group. That's it. The file stays in File Manager and shows up as an icon in its group.

—Kay Yarborough Nelson

Building the Windows environment is then simply a process of bootstrapping, having one program loading another, until the Windows desktop appears on your screen.

Running Windows Applications

Windows applications are different from DOS applications in a number of important ways. Under DOS, for example, an application can safely assume that it has the freedom to do just about anything it wants with both DOS and the PC hardware. This may include writing directly to the disk, accessing serial ports, and poking around in memory. With few exceptions, these types of activities are frowned on in a Windows application.

Rather than taking the initiative, a Windows application asks Windows to do things for it. Consequently, Windows can supervise and control nearly every aspect of an application's execution. As a result, Windows applications are remarkably cooperative. (Of course, you may write an uncooperative Windows program if you want to, but what is the point?) In a sense, Windows and any Windows applications that you run are treated as one large program running in the system virtual machine.

Application requests for keyboard input, mouse control, and display output are typically handled by routines that are part of Windows. However, Windows doesn't provide some services, such as disk access. When your computer needs services of this sort, the request is passed to the underlying operating system. Working through the restrictions imposed by the protected-mode software can be quite complex.

If, for instance, you want to use the Windows Notepad to edit a file named `TODO.TXT`, you start Notepad, bring up the dialog box for the Open option, type in the filename, and click the Open button. At this point, Notepad has two choices. It may ask Windows to open the file

for it, or it can attempt to open the file itself. In either case, eventually the `INT 21` hexadecimal interrupt instruction, the conventional method of passing a request to DOS, executes.

If Notepad (or Windows) was operating in real mode, the interrupt instruction would

EXTENDING DOS

When DOS 1.0 was introduced, *state-of-the-art hardware* meant an Intel 8088 microprocessor running at 4.77MHz, 64K of RAM, two floppy drives, and a monochrome monitor. Over the intervening 13 years, the capabilities of the cutting-edge PC platform have changed dramatically. DOS, however, has changed relatively little. Of course, Microsoft has added new features periodically: support for hard disks, networking, and internationalization. But underneath it all, DOS's operation still is based on the architecture of the 8088.

If the quality of an operating system was measured simply by the number of services it provides, DOS would receive poor ratings indeed. But although they were few in number, DOS's services were adequate for performing disk management and file operations, loading and executing programs, and managing the first megabyte of memory. If an application required a capability not provided by DOS, the application's developer had to include the code in the program itself.

Expanded Memory

At first, each application assumed that it had exclusive use of the PC and its resources and acted accordingly. As inevitable conflicts occurred, developers began to forge cooperative standards for extending DOS. One of the first such standards was the expanded memory specification (EMS).

The first implementations of EMS were hardware based. An EMS board functioned like a memory jukebox, using dedicated hardware to transfer 16K chunks of information back and forth from the PC's memory area to the EMS board's separate memory area. Access to EMS memory was obtained through a special software program called an expanded memory manager. Version 3.2 of EMS supported as much as 8MB of memory, while version 4.0 expanded EMS capacity to 32MB. For the most part, applications used EMS to store data.

Extended Memory

The PC AT, with its 80286 processor, was the first PC to support extended memory, memory beyond DOS's 1MB limit. (The memory below 1MB was dubbed real memory retroactively.) A 286 could address as much as 15MB of extended memory, but there was a catch. Extended memory was available only to a program running in the 286's protected mode. All existing PC applications, including DOS, were written for the 8088 and couldn't take advantage of this new memory bonanza.

IBM anticipated this problem, however, and included several

new functions in the PC AT's BIOS. These functions provided real-mode applications—standard DOS programs—with limited access to the 286's protected mode and therefore to extended memory. But although these functions provided access to extended memory, they didn't include any form of memory management. IBM didn't supply a standard method by which an application could reserve extended memory, nor did it establish a set method of determining whether another application already was using part of the memory.

In the mid-1980s, clever programmers discovered a way to access the first 64K of extended memory from DOS without switching to protected mode. This area of memory became known as the high memory area (HMA). Although the processor could access the HMA in real mode, accessing the remainder of extended memory still required that the processor switch into protected mode.

The 1988 release of the extended memory specification (XMS) provided a standard method for programs to access extended memory. All extended memory, including the HMA, is placed under control of the XMS software. Application programs then request access to extended memory through an XMS driver, which manages memory allocation, handles the details of switching between real and protected modes, and prevents program conflicts.

DOS Extenders

As the years passed and a DOS-compatible protected mode operating system failed to appear, necessity gave birth to a new solution, a so-called DOS extender. A DOS extender is a cross between an operating system and an ordinary function library. The extender lets an application written for DOS run in protected mode and access extended memory, while hiding the details from the application and the user.

The extended application normally runs in protected mode. When it needs to access DOS—to read from a file, for example—the routines in the DOS extender switch the system back to real mode and pass the application's request to DOS. Similarly, the DOS extender intercepts all interrupts (such as those generated by keyboard input, the PC's clock, or a serial port), switches to real mode, and passes them to DOS. When DOS finishes its processing, the extender switches back to protected mode and returns control to the application.

Simply put, the DOS extender is an interface between the application program and DOS. It fools the application into

pass control directly to DOS. But remember, Windows is operating in protected mode. In this case, the interrupt transfers control to Windows' DOS extender, which has set itself up to intercept such DOS function calls. The DOS extender examines the request to deter-

mine if it is something that it can handle itself or something that it must pass to the real DOS. In this case, the request is for a file operation, so the DOS extender decides that the request must go to DOS.

The DOS extender performs any needed ad-

thinking that DOS is a protected-mode operating system. Most importantly, however, it does so transparently. With these details taken care of, application programs are free to use as much as 16MB of memory on a 286 or as much as 4GB of memory on a 386 or 486.

EMS and the 80386

Technically speaking, the EMS standard is strictly a software interface and therefore makes no assumptions about underlying hardware. The happy consequence of this is that even systems containing no expanded memory may take full advantage of the capabilities of EMS. The software that makes this possible is called an expanded memory emulator.

Early emulators simulated EMS memory by swapping to and from the system's hard disk or extended memory. These emulators sometimes were quite slow, however, and better performance was obtained by using a real EMS board. The situation changed dramatically, however, with the introduction of the 80386.

The 386 represented a significant improvement over the 286. (From a software point of view, the 486 is identical to the 386.) Foremost, the 386 supports paging, the ability to make a particular chunk of physical memory appear as if it was located at any specified memory address. If you think that description sounds suspiciously like the function of an EMS board, you're not alone. It wasn't long before 386-based memory managers, such as 386MAX, QEMM, and DOS's EMM386, gave users the ability to convert XMS memory into EMS memory at top speed.

In addition to emulating EMS hardware, 386-based memory managers bring another benefit to PC users: the ability to "backfill" memory below 1MB. In a sense, a 386-based memory manager functions like a miniature operating system. Taking over the PC, it switches the 386 into 32-bit protected-mode operation to use the chip's built-in paging functions. The manager then instructs the 386 to create a virtual machine in which to run DOS and other real-mode programs. To DOS, the virtual machine looks just like an 8088.

Using paging, the memory manager can remap portions of extended memory to appear anywhere within DOS's 1MB memory area. Most PCs have empty areas in the area of memory from 640K to 1MB, which is commonly referred to as the upper memory area (UMA). In DOS 5, for example, you may instruct EMM386 to remap extended memory to the unused portions of the UMA, which lets you load memory-resi-

dent programs and device drivers above the 640K boundary.

EMS and VCPI

Memory managers based on the 386 hadn't been around for very long before problems began to emerge. Users would install a memory manager, only to have one or more applications suddenly refuse to run, return cryptic error messages, or run more slowly than before. These problems arose because both the memory manager and applications that use DOS extenders were vying for control of the PC and extended memory.

The Virtual Control Program Interface (VCPI) is defined as an extension to the EMS specification. Services are provided by the EMS emulator (the VCPI server) to the DOS extender (the VCPI client). Simply put, VCPI lets EMS emulators and DOS extenders coexist on 386-based PCs by providing them with a way to cooperatively manage the memory mapping and mode-switching capabilities of the 386.

Windows and DPMI

VCPI was developed to let applications using DOS extenders coexist with 386-specific memory managers. Under this standard, both the VCPI server and client assume roles as trusted peers that alternate control of the PC. This makes it impossible for a VCPI server to enforce device virtualization (running a graphics application in a window, for example), provide centralized virtual memory management services, or shield one DOS extender from interference by another.

When Microsoft was designing Windows 3.0, it realized that the existing implementation of VCPI wasn't robust enough to permit protected-mode applications to multitask under Windows. VCPI also required a 386 or better processor. Although work was underway to extend the VCPI standard, Microsoft chose to create a new, incompatible interface called the DOS Protected-Mode Interface (DPMI) for Windows.

By using the protection system built into 286 or later CPUs, a DPMI server, such as Windows 3.1, can run at a higher privilege level than its clients. This lets the DPMI host support protected-mode execution while preventing applications from interfering with each other. Most Windows applications don't need to use DPMI services directly, because these services are provided by the Windows application programming interface (API).

—R.L.H.

dress translations, copies data from extended memory into conventional memory if necessary, then switches the PC into real mode using the functions provided by the Windows DPMI server. This done, the DOS extender then re-issues interrupt INT 21 hex to pass control to DOS. Eventually, DOS finishes processing the request, and the procedure is reversed. The DOS extender uses DPMI functions to switch the CPU back into protected mode, translates addresses, copies data, and finally passes control back to Windows and Notepad.

DOS Applications

Non-Windows applications are designed to run with DOS rather than with Windows. They can't take advantage of the Windows graphics interface, and often they don't have menus or dialog boxes nor make use of the mouse. In fact, they typically know nothing about Windows or multitasking. Despite their lack of Windows awareness, most DOS programs do run under Windows 3.1.

Each time you start a non-Windows application in Standard mode, Windows creates a temporary application swap file for that application. When you switch away from the application, Windows copies the application from memory to the swap file, making the memory available for use by other applications. Only one non-Windows program may run at a time, regardless of how many are loaded.

If Windows is running in Enhanced mode, however, things proceed a bit differently. The V86 mode of the 386 and 486 lets Windows create a virtual machine for each non-Windows application. Settings in that application's program information file determine whether a non-Windows application may run only in the foreground, also run in the background, or take exclusive control of the PC.

Virtual Machines

As I explained earlier, the capabilities built into 386s and 486s make virtual machines possible. The exact setup of a virtual machine, however, depends on the software used to tap this resource. In the best of all possible worlds, virtual machines would be completely independent; each virtual machine would run its own copy of DOS and have its own memory area. No virtual machine could, by its actions or inaction, harm another virtual machine. Unfortunately, Windows 3.1's implementation of virtual machines falls short of this goal.

The virtual machines created by Windows'

Enhanced mode are only somewhat independent. Assume, for example, you start two MS-DOS sessions from Program Manager's Main Group. If you invoke a memory-resident scheduler in the first session (the first virtual machine), Windows doesn't give you access to that scheduler from the second session (the second virtual machine). Any device drivers or memory-resident programs that are in memory before you start Windows, in contrast, are available in all virtual machines.

This duality arises because the virtual machines are, after all, only simulations. The Windows virtual machine manager maps some corresponding memory areas of each virtual machine to the same physical chunk of memory. The 16 bytes of the PC interapplication communications area, located at memory address 0:4F0, are held in common by all virtual machines. If you write to this area in one virtual machine, you can see the change immediately in a different virtual machine.

It's not clear why Microsoft chose to implement virtual machines in patchwork fashion—perhaps it was to save memory. If so, it was a poor choice. The lack of isolation between virtual machines compromises system integrity. A single errant instruction in a virtual machine can bring the entire Windows system crashing down. To see this for yourself, close all applications running under Windows, run Debug from Windows' File Manager, type the command `G=FFFF:0`, and press the Enter key.

Read On

Although not quite an operating system, Windows is a complex piece of software—so complex, in fact, that entire books are devoted to explaining the machinations used to bring a graphical user interface, multitasking, and virtual memory to DOS. If this brief overview has piqued your curiosity, the books listed below can help you investigate the topic further. ■

Suggested Reading

Duncan, Ray et al. Extending DOS: A Programmer's Guide to Protected-Mode DOS, *Second Edition*, Addison-Wesley, 1992, ISBN 0-201-56798-9.

Pietrek, Matt. Windows Internals: The Implementation of the Windows Operating Environment, Addison-Wesley, 1993, ISBN 0-201-62217-3.

Schulman, Andrew et al. Undocumented Windows: A Programmer's Guide to Reserved Microsoft Windows API Functions, Addison-Wesley, 1992, ISBN 0-201-60834-0.

NOT JUST Window Dressing

Don't overlook the bevy of accessories that Microsoft bundles with every copy of Windows 3.1.

by Kay Yarborough Nelson

WHEN YOU BOUGHT WINDOWS, YOU PROBABLY DIDN'T GIVE ITS collection of "free" accessories a second thought. Be honest: Can you name more than five of the programs? Do you know how many more are included? Do you care? ☐ Well, perhaps you should. Version 3.1's Accessories window offers 13 programs: Calendar, Calculator, Cardfile, Character Map, Clock, Media Player, Notepad, Object Packager, Paintbrush, Recorder, Sound Recorder, Terminal, and Write. ☐ True, some of these applets, as they're sometimes called, are limited in scope, but a few of them are downright useful. Here's what the full complement of

Windows accessories can and can't do for you.

Write

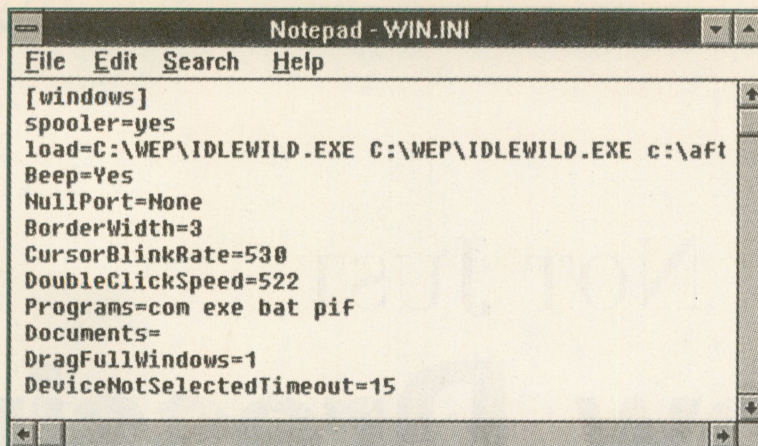
The Write word processor tops my list of worthwhile Windows accessories. Less versatile than such full-featured Windows programs as Ami Pro, WinWord, or WordPerfect for Windows, Write is a more capable editor than Notepad. If your needs are modest, Windows Write may well be the only word processor you will require.

Among the program's virtues: It has a

search-and-replace feature, it accepts graphics, and it lets you do basic formatting, such as inserting headers and footers; changing tabs; changing alignment; employing single-, double-, or space-and-a-half line spacing; specifying indents; and applying special formatting to text such as boldface, italics, underlining, subscripts, and superscripts. Write even has a handy ruler that makes it easy to format documents using a mouse.

What it lacks are sophisticated features, including a spelling checker, a table editor, an

The Notepad is a useful tool for editing your WIN.INI file, because INI files are associated automatically with this accessory.



equation editor, a grammar checker, document comparison capability, automatic footnotes, a collapsible outliner, and mail merge. Write further restricts you by letting you open only one document at a time, and you must tell it to paginate.

If you must have features of this type, by all means get a Windows word processor. But if your word processing consists of typing letters, memos, and short reports, Windows' own Write will serve you well.

The program saves in the Microsoft Word for DOS format (DOC) and TXT format, as well as in its native WRI format. But because it doesn't support fancy formatting, you should avoid importing heavily formatted files from more powerful word processors. If you open a document from another word processing program in Write and save it, you may lose the formatting. Unfortunately, you may not discover this until you open the document within its original word processor.

Notepad

Because Notepad is designed for editing and creating ASCII files, it's a natural for working with AUTOEXEC.BAT, CONFIG.SYS, or batch files. If you make it your preferred editor for such tasks, you'll never have to worry about mistakenly saving these files in a formatted word processing file, which prevents DOS from running them.

Notepad is practical for editing Windows' INI files, too. In fact, INI files automatically are associated with the Notepad, so you may edit WIN.INI by clicking on the Run command and typing WIN.INI when prompted for a filename. Notepad then starts automatically, bringing up WIN.INI for editing.

When it comes to formatting, Notepad can't compete with fancy editors. Although it can

wrap text within a window, permitting you to see complete lines at a glance, it won't let you dress up text by, for example, double-spacing a paragraph or boldfacing a word. Another drawback is that it can't handle large files—approximately 15–20 pages of text is about all it can take. But, then again, how long a batch file can you write?

Notepad does, however, offer at least one neat formatting option: the ability to format in-

formation stored in headers and footers. To see how things work, choose Print from the File menu; then click on Setup to change a Notepad document's margins and select Headers and Footers.

To include the current date and time, filename, and page number in headers and footers, type the following codes in the Header or Footer section of the Page Setup dialog box:

```
&D CURRENT DATE
&T CURRENT TIME
&F FILE NAME
&P PAGE NUMBER
```

Normally, headers and footer are centered. To have them print flush left, use:

```
&L FLUSH LEFT
```

To have them print flush right, use:

```
&R FLUSH RIGHT
```

Use this sequence to center a subsequent part of a header or footer:

```
&C CENTERED
```

For example, to set up a footer that shows the filename flush left, the current date centered, and the page number (with the word *Page*) flush right, type the following in the Footer box:

```
&L&F&C&D&RPage &P
```

Of course, Notepad also functions as a note keeper. And if you like to incorporate the date and time in your jottings—perhaps because you take orders over the phone—Notepad offers you an indispensable tool: the Date/Time

command. When you select Date/Time from Notepad's Edit menu (or press F5), Notepad adds the current date and time to the file in which you're working.

This makes Notepad useful for maintaining a log file. If you start the first line in a Notepad file with the command .LOG, Notepad adds the date and time to the end of the file each time you open it. If you bill by the hour, this provides a neat way to keep track of your charges, without buying a sophisticated time-management program. Here's how to do it.

Open the Notepad and type .LOG. Save the file with a client's name or with the name of a project. Do the same for each client or each project on which you work. When you start work on a particular client's project, open the appropriate Notepad file and type the client's name or a description of the task you're starting. Save the file and exit from Notepad. When you finish, open the file again to add a new date-and-time stamp. You then can produce a log of billable hours by subtracting your ending times from your starting times.

Whether you're taking notes or working with longer files, remember that the Notepad's documents are ASCII files. Open them within



Paintbrush lets you import graphics files stored in BMP, PCX, and MSP format. You may save edited images only in BMP and PCX format.

your regular word processor as you would any other ASCII file.

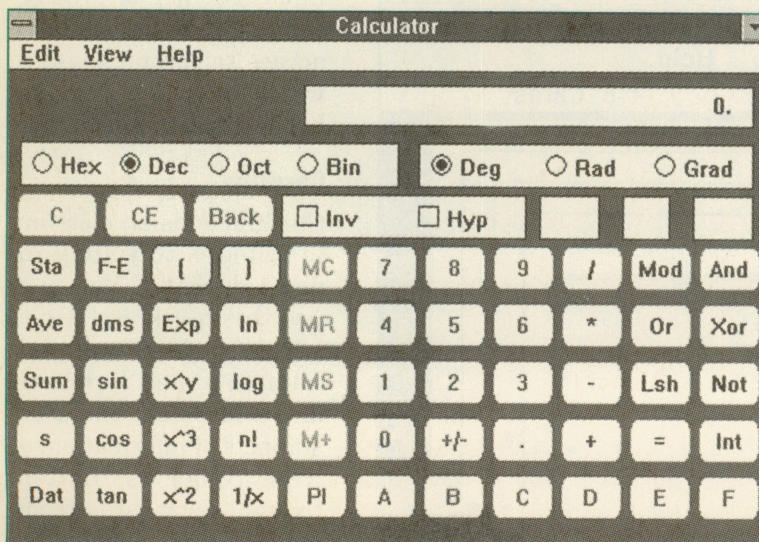
Paintbrush

If you don't need a full-blown graphics program but want to create simple graphics from time to time, you'll find Paintbrush worthwhile. It looks like a simple painting program, but hidden beneath the surface are numerous sophisticated features. Among the most notable are tools for creating spectacular special effects, which let you do such things as flip images horizontally and vertically, invert (reverse) colors, stretch cutouts, sweep colors, and modify bit maps pixel by pixel.

You have the ability to edit bit-mapped graphics stored in the following formats: BMP (bit-mapped graphics), PCX (a PC-graphic format readable by almost any graphics or desktop publishing program), and MSP (Microsoft Paint). Although you can't save images in MSP format, you can save them in BMP or PCX format. Because most Windows programs accept images in one or both of these formats, it's a simple matter to export bit-mapped color images—perhaps maps, charts, diagrams, or detailed artwork—to other Windows programs.

Calculator

At first glance, Calculator looks ho-hum. Initially, you



Choosing the Scientific option in the Calculator's View menu lets you substitute a full-function scientific calculator for the standard arithmetic calculator.

see a standard arithmetic calculator with the usual buttons for handling addition, subtraction, multiplication, division, square roots, percentages, and reciprocals. Four memory buttons are stacked along the left side of the display.

But more is hidden from sight. If you open the View menu and choose the Scientific option, you uncover a full-function scientific calculator that can handle many statistical and trigonometric functions. It lets you work on numbers as small as 10^{-310} (that's pretty tiny) and can compute in the decimal, octal, binary, and hexadecimal number systems.

Calculator has other tricks. For example, you can press Enter or click on the equal sign (=) to tell the standard or scientific calculator to do the last part of a calculation again. Say, for instance, that you've added 5,422 and 6,529 and then divided the sum by 3. The result is 3,983.66. If you press Enter again, Calculator divides that result by 3, giving you a final value of 1327.88.

Calculator is one accessory you shouldn't overlook; it's a treasure.

Object Packager

A little-known and underused accessory, Object Packager can turn just about anything you can think of into an icon representing a piece of information, or object. The information doesn't have to come from a program that supports object linking and embedding (OLE), but you must embed the icon in a program that supports OLE.

For example, you can even embed a DOS

command in a program that supports OLE, and DOS knows nothing about OLE. You might want to create an icon that retrieves a directory listing from DOS when you click on the icon.

Here's another example of how you can use embedded icons. Imagine that you have a report that cross-references other reports. You can use lengthy footnotes to clarify the references, but you may find it more effective to use Object Packager to embed icons representing relevant parts of the other reports (or the complete reports). Your readers can simply double-click on the embedded icons and read the other reports. This capability is especially useful on networks, because then both you and your readers can have access to a large number of documents.

Here's another trick. If you're working on a document that uses a lot of calculations, embed Calculator in that document. When you need to perform a calculation, you simply can double-click on Calculator's icon to open it.

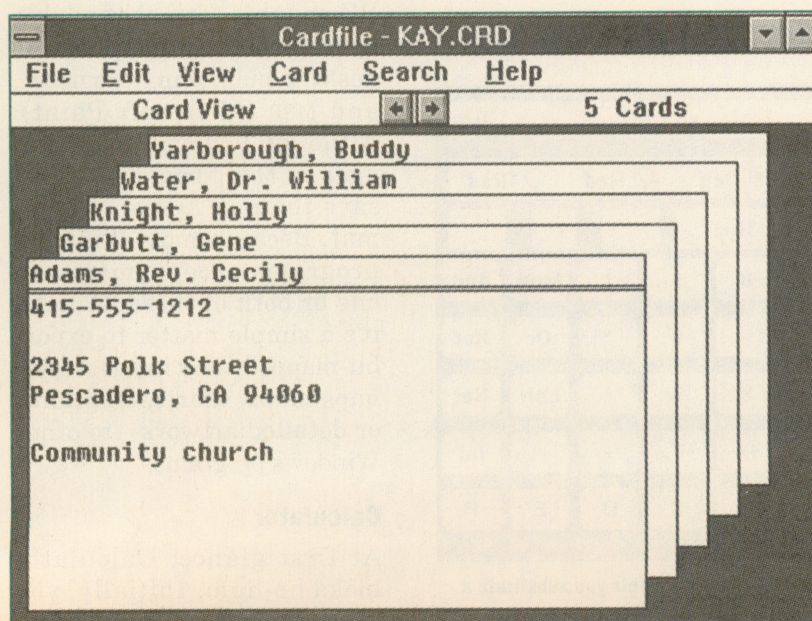
Instructions for using the Object Packager can get complicated, because embedding icons is more sophisticated than linking data with dynamic data exchange (DDE), another type of linking you may set up in Windows, although not with an accessory. Despite its complexity, embedding objects has an advantage over using DDE. Embedding puts the data associated with an icon into your file; thereafter, double-clicking on a data object starts the program that created it. Because the embedded data becomes part of the document, you are able to give the document to somebody else and not

worry about breaking any links. The person who receives the file must have access to the program in which you created an embedded document.

Cardfile

Cardfile adds an electronic Rolodex to your Windows desktop. You may use this minidatabase to keep track of people's names, phone numbers, and addresses, and store snippets of information, as well. Space is limited, though. Each card accommodates only 11 lines of text, and the number of

You can use Cardfile to create an electronic Rolodex that stores contact names, phone numbers, and snippets of information.



cards you may create depends on the amount of available memory. Of course, Cardfile offers an index field and lets you print a sorted list of cards, which is useful if you're keeping a name-and-address list or creating an alphabetized bibliography for a research project.

Although Cardfile's ability to incorporate graphics and sounds into the cards seems flashy, I haven't found this feature to be useful. But I do appreciate Cardfile's ability to dial phone numbers without leaving Windows. It's easy: If you have a Hayes-compatible modem, you simply display the correct card and choose Autodial from the Card menu. One warning, though: Cardfile isn't smart enough to distinguish between street addresses and phone numbers. Be sure to list the phone number on the first line of each card so that your long-distance phone bill doesn't contain unexpected surprises.

Calendar

Calendar, Windows' built-in appointment calendar, is by no means fancy, but it's not hard to master. You may choose between two views: a daily display (press F4 to go to a specific day) and a monthly display. If you're the sort of person who misses appointments, you may want to use the alarm (press F5 in the daily display) to be reminded about important engagements. You can set it to ring at the scheduled time or as early as 10 minutes ahead of time.

If you also need a simple scheduler or time manager, Calendar fits the bill nicely. It can tell you on which day of the week a date falls and lets you write short notes to yourself at the bottom of its screen. But the program is no substitute for a full-blown personal information manager (PIM), such as Polaris' PackRat or MicroLogic's Info Select. If you need to track clients, manage a database of contacts, or something similar, go for a real PIM.

Terminal

A bare-bones telecommunications program, the Windows accessory Terminal lets you communicate with information utilities such as CompuServe, Dow Jones News/Retrieval, and the Source, and dial up elec-

tronic bulletin boards. Naturally, to do all this, you need a modem.

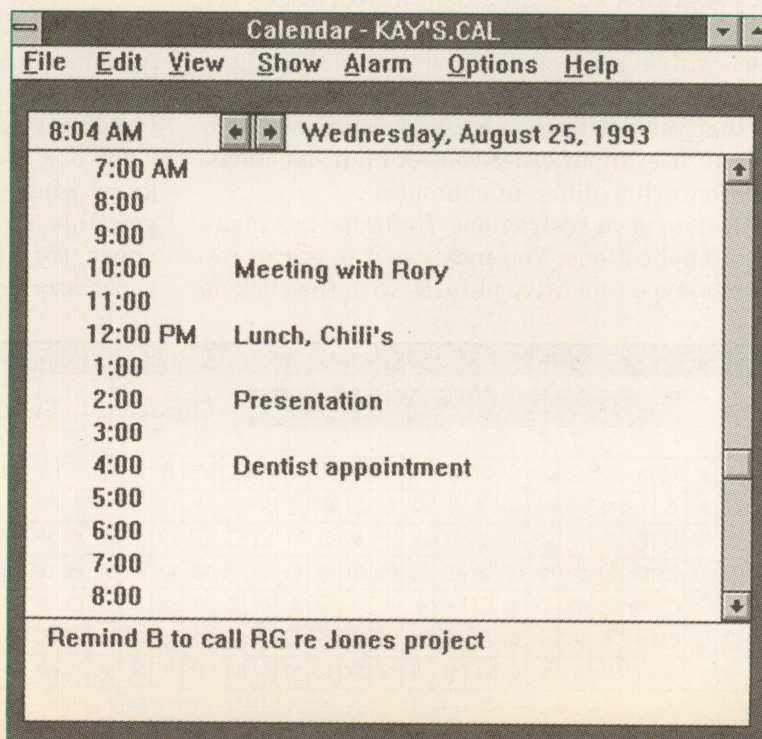
Terminal lets you send and receive files and messages, but its interface isn't exactly "friendly." A number of alternatives, including CompuServe Information Manager for Windows and America Online, are much easier to learn and use if you're just starting out in telecommunications. If you're an old hand with modems, you'll find Terminal limiting. A few function-key shortcuts are virtually its only frills.

Media Player

When Microsoft upgraded from Windows 3.0 to version 3.1, it added multimedia capabilities, which means that you now can create and play Windows files that incorporate text, animation, and sound, including Musical Digital Interface (MIDI) sound. Media Player gives you access to this capability.

Media Player isn't very high end, but you can use it to control any Media Control Interface devices you've installed in your system and to play multimedia data files (animation, video, digital audio, and MIDI sounds). The multimedia applications you buy—CD-ROM players, animation software such as Macro Media Director, or CD-ROM games and encyclopedias—come with their own controls for playback.

An incredible number of multimedia applications are available for Windows, ranging from



The Calendar lets you write short notes to yourself at the bottom of the screen.

games to entire encyclopedias, but to run such programs you need the right type of hardware: sound boards, CD-ROM players or audio CD players, and videodisc machines. Media Player lets you work with simple devices, such as an audio CD player (in which case it plays the disc that is in the device), or compound devices, such as sound boards.

Sound Recorder

If your PC has a sound card, speakers, and a microphone, you can record sounds and then use Sound Recorder's control panel to tell Windows to play the sounds at start-up or shutdown, or when another event occurs. Sound Recorder also lets you add voice annotations to your documents.

The program offers all kinds of weird options, including choices that let you make sounds play backward, mix sounds, speed up or slow down sounds, change the volume, and turn on an echo effect. It's fun to experiment, and if you don't like the effects you create, a handy Revert command on the File menu puts things back the way they were.

Recorder

Recorder is a so-called macro recorder, a program that allows you to carry out a series of actions, assign the sequence a name, and play it back at a later time. Recorder is more limited than many other programs of its type, however. If, for instance, you are used to creating macros in programs such as Excel or WordPerfect, which have special command languages, you either will be relieved to know that no such language exists for Recorder or dismayed to discover that you don't have access to commands that permit user input or let you set up instructions that branch to different subroutines.

Despite such restrictions, Recorder has plenty of applications. You may use it to start programs, type repetitive phrases with the click of

the mouse, and handle other similarly routine transactions.

Character Map

Character Map lets you copy special characters and symbols into Windows and non-Windows documents. It's useful if, for instance, you need symbols that your word processor doesn't provide or that you can get only by typing character-set codes or strange commands.

When you select a particular font, the display shows at a glance the available special characters. You transfer one or more items to the Characters to Copy box and later use the Clipboard to transfer them to your document.

Clock

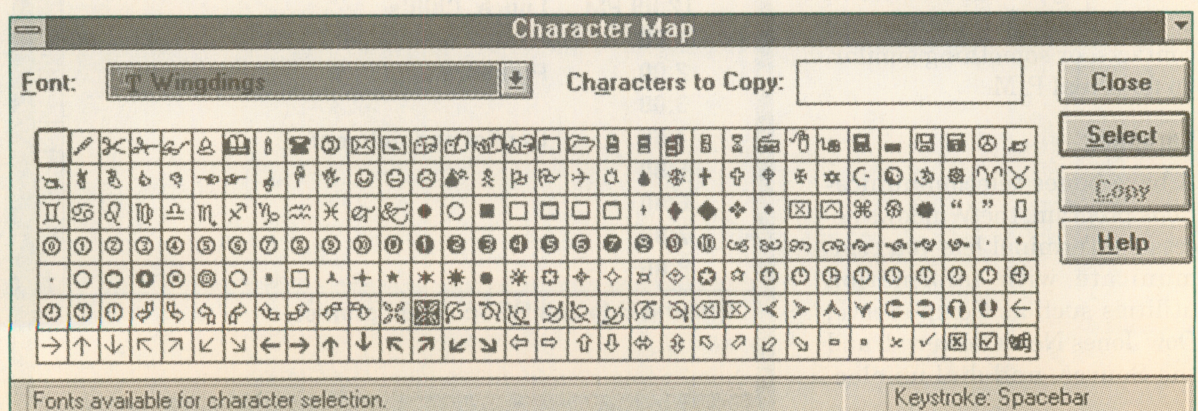
You can't do much more with Clock than tell the time. Your choices are limited to displaying a clock on your desktop, changing the display's font, and switching from a traditional clock face to a digital display.

If you want a digital clock on your Windows desktop, double-click on the Clock icon, open the Settings menu, and click on the Digital option. Next, choose Properties from the Program Manager's Run menu and click Run Minimized. Then press Ctrl and drag a copy of the clock into the StartUp group. A small digital clock will appear when you start Windows and will remain visible as long as the bottom of your desktop is in view.

Try Them...

As simple and practical as Clock is, it won't appeal to everyone. No matter; at least one of the remaining 12 accessories is bound to offer the right mix of features. Of course, you'll never know what any of these programs can do for you unless you do a little experimenting. Go ahead, try a few. You just might find a handful of accessories that you really like. ■

You may use Character Map to insert special symbols into your documents. Wingdings is one of several available fonts.



LOOKING INTO The Future

DOS isn't dead yet, but Microsoft's ballyhooed graphical user interface may be coming to a desktop near you.

by Anne Fischer Lent and Patricia S. Flanagan

WHEN YOU THINK OF THE COMPUTER INDUSTRY, PICTURE AN ESCALATOR that keeps moving up to higher levels. Every step leads to faster computing, more capable products, and, ultimately, greater efficiency. All you have to do is grab your wallet and jump on! □ Certainly most hardware and software manufacturers and many writers in the industry press embrace this rosy metaphor of continuing change and improvement. The flip side, however, is a darker image: Unless you climb on-board, you'll find that the computing world has passed you by. With all the noise lately about Microsoft Windows, many DOS users wonder if they're stuck

in a groundlevel operating system that's going nowhere fast.

Perhaps you have been asking these same questions: Is everyone moving to Windows? If so, which version is right for me—the popular 3.1 or the high-end Windows NT? Or should I wait for the late-1994 release of what Microsoft has dubbed “The Chicago Project” and some call Windows 4.0? How do I know when it's time to move? And, finally, if I don't step up to the Windows graphical user interface (GUI), will I be left all alone at the cold command line?

Not likely. According to Microsoft and industry analysts, you and more than 100 million users worldwide still plug into DOS. Your future looks not only bright, but exciting. You'll still have lots of DOS products from which to choose.

But be forewarned: In a few years you, too, probably will be swept along with the Windows crowd. At least, it will become increasingly difficult to remain rooted strictly in DOS. You either will be a full-fledged Windows user or you'll be running DOS from within Windows.

Anne Fischer Lent writes frequently on computers and technology. She is coauthor, with Stan Miastkowski, of *The Windows for Workgroups Bible* (Addison-Wesley, 1993). Patricia S. Flanagan is a writer and editor who lives in southern New Hampshire.

DOS RESOURCE GUIDE

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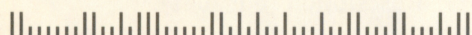
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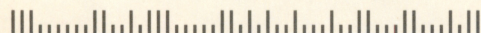
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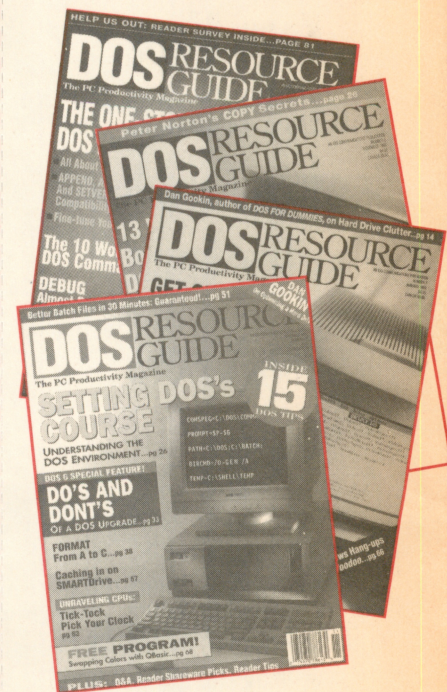
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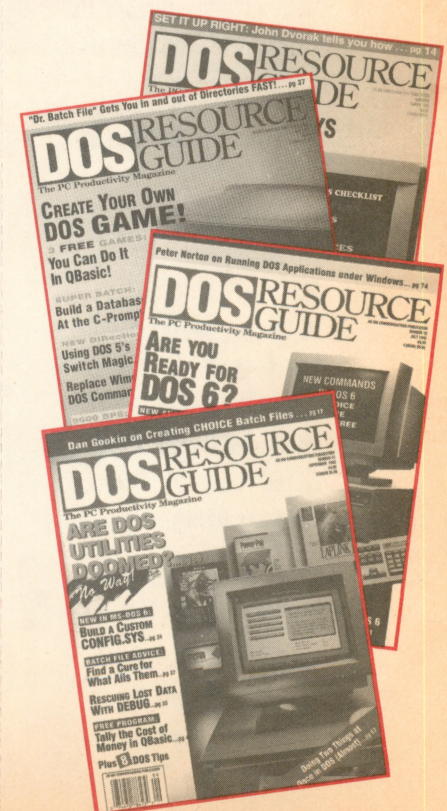
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THE COVER PRICE

It's in the Numbers

Windows applications account for the largest portion of U.S. software sales. According to the Software Publishers Association, in the first quarter of 1993 sales of Windows applications surpassed those of DOS for the first time. During that period, Windows-based applications racked up some \$669 million in sales, up 114 percent from the first quarter of 1992. Meanwhile, sales of DOS-based applications fell by 20 percent to \$502 million.

On the hardware side, some 72 percent of new computers now come pre-loaded with Windows, according to Computer Intelligence InfoCorp., a San Diego-based market research firm. And you can expect that number to grow in the coming years.

"One of Microsoft's stated goals is 'Windows everywhere,'" says Dan Ness Jr., senior industry analyst at Computer Intelligence InfoCorp. "Without question, Windows will affect everybody who uses a computer in some way. But [Microsoft is] not talking about within a year or two."

Rather Fight Than Switch

Drastic changes within the computer market just don't happen overnight. Slowing Windows' growth is the fact that some 50 percent of the installed base of PCs can't even run Windows, Ness explains. These include 8088- and 286-based machines and 386s with insufficient memory or hard disk space to support the Windows GUI on top of DOS. Typically, he says, replacing the current base of computers takes five to seven years.

"There are still a lot of existing computers that have a lot of life left in them," he states. Similarly, many DOS users are not anxious to rewrite or replace their applications with Windows versions.

John Chait, Lotus Development Corp.'s product manager for DOS spreadsheets, cites three reasons why users would rather stick with DOS: "The first is the familiarity with the command line. The second is speed. And the third is compatibility. A lot of DOS users have

got mission-critical applications that they don't want to abandon."

"Some of our vertical markets are very reluctant to move, especially the legal market," says Jeff Larsen, corporate communications specialist at WordPerfect Corp. "They've got tons invested in macros and keystroke combinations, and they don't want to change."

And then there's the question of stability. DOS programs simply are less likely to crash than their Windows counterparts.

Stephen Borsher, owner of SIB Consulting, a company that builds data-collection and data-

TIP WHAT CAN YOU DRAG AND DROP?

You may have heard a lot about being able to "drag and drop" in Windows, but such tricks usually aren't well documented. Briefly, here are the situations under which you may drag and drop in Windows 3.1 and the instructions for carrying out each procedure:

- To put icons in your Program Manager groups, simply drag a file's icon from File Manager's File window (the right side of the display) and drop it in an open Program Manager group.
- To print documents, open Print Manager (double-click on its icon in Program Manager's Main group) and then minimize it. Now you can drag a document from File Manager and drop it on the Print Manager icon to print it.
- To start a Windows program and open a document, drag the document's icon from File Manager and drop it on an open program window. If you have associated files of a particular type with a program, you may drop the icon of a file of that type on the associated program icon.
- To move a file to another directory, open File Manager and drag the file from its File window (on the right side of the screen) to the appropriate directory folder in File Manager's Tree window (on the left side of the File Manager screen). To move files to the current directory of a different drive, drag them to a drive icon at the top of the screen.
- To move a directory, you may open File Manager and drag the directory to a different part of the directory structure. To make a directory into a subdirectory, drop it on the icon of another directory.
- To move a copy of a program icon to another group within Program Manager, press Ctrl while you drag the icon. Release the key to drop the icon. You'll then have a copy of the icon in its original group and in its new group.
- To link a file to an open Windows document, display File Manager and the open document in separate windows on the desktop. Press Shift-Ctrl while selecting and dragging the file's icon to the open document. If you perform this procedure without pressing Shift-Ctrl, Windows embeds the file in the document, instead. (When a file is linked to a document, the document changes if you update the linked file. If you embed a file in a document, subsequent changes made to the file aren't made to the copy of the file embedded in the document.)

Individual programs also may provide drag-and-drop capabilities. For example, word processing programs such as Word for Windows and WordPerfect for Windows allow drag-and-drop text editing.

—Kay Yarborough Nelson

base systems, mostly in DOS, has seen the migration to Windows from a hands-on perspective: "It's been a complicated environment [for which] to develop. Developers have had a steep learning curve and, consequently, mistakes have been made.

"The current Windows is really just a five-year-old product, and people need practice on developing products that take advantage of 3.1's features, such as OLE [object linking and embedding]."

DOS at the Wall

Given the questions about Windows' stability and opposition to abandoning DOS, what is pushing the dramatic development in Windows? One answer, says Paul Bonner, an industry consultant and developer, is DOS itself.

"Developers have run into the wall with

DOS," he explains. "There is really not much more you can squeeze out of it. With the memory limitations and the lack of standardization in terms of user interfaces and inter-application communication, it becomes very difficult for developers to get much more out of it.

"At the same time, a lot of the advantages that originally were pretty theoretical with Windows are starting to turn into reality."

These include so-called "suites," which provide tight links and communication between broad sets of applications. Companies such as Lotus and Microsoft, Bonner explains, are starting to produce software suites (including a spreadsheet, word processor, and so on) that are designed to work with one another and share elements, such as a macro language. As a result, he states, users can tailor applications to work the way they do, combining the best elements to meet their needs.

OLE is another highly touted Windows benefit. This feature lets a user, for example, embed in a word processing document a spreadsheet that's not just a representation of the numbers but, instead, is a live, working model that can be manipulated using all the elements of the spreadsheet package.

In the multimedia arena, Bonner says, Windows has provided standards for sound-card and video developers that have caught the attention of the industry. Indeed, if producing presentation graphics and high-quality sound is your goal, Windows applications offer the most advanced tools for the mass market.

Finally, for many users, particularly novices, Windows provides an attractive, less daunting interface for its applications. Consequently, users often can "get up to speed" more quickly than with many DOS programs. This is especially important within large companies where dozens, if not hundreds, of employees must learn a new application.

Leaping onto the Windows Bandwagon

Of course, DOS products, too, can incorporate some of the best elements of Windows. Borland International's Quattro Pro 5 DOS spreadsheet offers a Windows-like graphical look

TIP FINDING WINDOWS' EASTER EGG

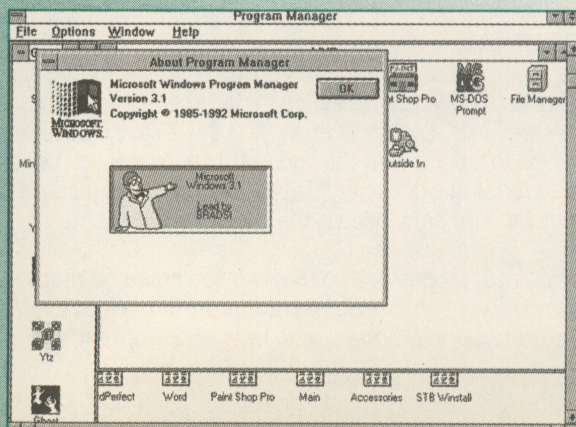
Programmers often build secret, hard-to-find effects, called Easter eggs, into their programs. These usually are screens of credits listing everybody who had a major role in developing and testing the program.

Here's how to find the Easter egg (see the figure) in Windows 3.1. Press the Shift and Ctrl keys and keep them down through the remaining steps:

- Choose About Program Manager from Program Manager's Help menu.
- Double-click on the Windows icon.
- Nothing will happen. Click OK.
- Perform steps 1 and 2 again. A flag waves and a message appears.
- Click OK.
- Perform steps 1 and 2 one more time. You'll hear a sound (if you've installed a sound card or the PC Speaker driver), and you'll see a randomly chosen character presenting a list of credits for everybody (or just about everybody) who worked on Windows 3.1. The characters are giants at Microsoft: Bill Gates—he's the one with the bow tie—Steve Olmer, Brad Silverberg, and the "bear" who beats on programmers—an in-house joke.

—Kay Yarbrough Nelson

The names of the Windows 3.1 development team scroll through the box. The funny-looking guy with the glasses is Microsoft CEO Bill Gates.



and feel without its bulk or memory requirements. And its list price is terrific—only \$99.95.

WordPerfect's first DOS upgrade in over three years, version 6, also takes advantage of a what-you-see-is-what-you-get (WYSIWYG) interface and DOS speed. In the two months following the product's release, WordPerfect shipped 670,000 copies, making 6 the most successful product launch in the company's history and one of the most successful in DOS history.

Despite such promising numbers, most software publishers, including WordPerfect (which claims 10 million DOS users), are focusing their attention on Windows.

"While our percentage of the DOS market has increased," Larsen of WordPerfect explains, "the DOS market as a whole has really been shrinking in the last six months. We've got to provide solutions for our DOS users as long as there are a substantial number of them. But definitely our focus is Windows, as well. We have probably double the resources on Windows that we have on DOS.

"I don't think you'll see revolutionary changes in our DOS product, anything more than 6," he continues. "We'll cater to the DOS base that we have, but we don't see that base growing."

Chait of Lotus agrees. "DOS is declining, but it won't go down to zero," he adds. "The size of the Windows pie is growing because customers are looking at value. Many are looking at suites, where they can get e-mail, spreadsheets, word processing, and other major applications all in one package, and they're buying this for the entire corporation."

And, while the three DOS publishers—IBM, Microsoft, and Novell—have new DOS versions and are planning subsequent releases, all three market their products as a terrific environment for running Windows. You can't escape it.

Novell DOS 7, an upgrade to Digital Research's DR DOS 6 (which Novell acquired), includes advanced networking features and security. The company is marketing it as the "best foundation for Microsoft Windows."

IBM contends that it, too, has created a better DOS for running Windows. Wally Casey, a

TIP HOW FILE MANAGER BEATS DOS

Windows' File Manager does a few things better than DOS. It copies disks faster, because it reads all of the disk into memory and then does its copying. It copies files more efficiently, too, because when a disk fills and you get a "Disk full" message, you may insert a fresh disk and keep on copying.

It's easier to copy, move, and delete files in File Manager than from the DOS command line, because you don't have to figure out a complicated wildcard pattern. The filenames are listed on the screen, and you may press Ctrl and click the left mouse button to highlight multiple files. Telling Windows what to do with the selected files is simple, too: Press F8 to copy files, F7 to move them, and, of course, Del to delete them.

Renaming and deleting directories also is simpler in File Manager than in DOS, unless you have upgraded to DOS 6.x, which offers the MOVE and DELTREE commands. (These commands let you relocate and rename files and directories, and delete directories that aren't empty.) And, to reorganize directories, you may drag them to a new position in the directory tree.

—Kay Yarborough Nelson

director of marketing, explains that through a source code agreement, now lapsed, every time Microsoft developed a new version of DOS, IBM took its code and enhanced it. PC DOS 6.1 has about 100 enhancements to Microsoft's DOS 6, Casey says. What makes IBM's PC DOS 6.1 better for running Windows are general improvements that allow large programs to operate more smoothly. "But that's as applicable to DOS as it is to Windows," Casey says.

As you might guess, Microsoft stands by its DOS products but sees Windows as its (near) future. "It's been true for a long time that we focus most of our resources on Windows applications," explains Richard Friedman, product manager for MS-DOS. "DOS users will have to depend on companies other than Microsoft for future DOS applications.

"The trend toward Windows will be a continuing trend," he says, "but Microsoft will continue to evolve MS-DOS as a stand-alone, traditional DOS that runs stand-alone applications."

Sounds reassuring. But DOS's status may change forever in 1994, when Microsoft is scheduled to release its new Windows, code-named The Chicago Project.

An OS of Its Very Own

Windows is a graphical user interface that sits atop DOS. You need DOS to run Windows 3.1. But DOS is not the underlying operating system for Microsoft's other Windows, NT (which stands for *New Technology*), nor will it run Windows 4.0 (Chicago).

Windows NT is a 32-bit operating system de-

veloped more for powerful, networked PCs at the corporate level than for standard desktop machines. Although it can run some DOS and standard Windows software, NT also delivers many high-end benefits, including true multitasking and built-in client/server networking capabilities (see the sidebar "Windows Shopping").

Most of what has been published about Chicago, which was in alpha testing as this issue went to press, is speculation. Microsoft officials have disclosed, however, that its new Windows version will include 32-bit computing power and the ability to run DOS programs from a Window.

Since it first released Windows, Computer Intelligence's Ness says, Microsoft has weathered much criticism that Windows is not as secure or stable a product sitting on top of DOS as it would be with its own operating system. "So [its] goal was essentially to incorporate the file system of DOS so that wouldn't be an argument anymore," he says.

As a result, new PCs shipped with Windows installed probably will not have DOS, but only a DOS emulator. "Users still will be able to run DOS programs," Ness explains. "But what it means is that DOS is now more and more going into the background."

A Matter of Choice

Wait—don't throw away your DOS software. No one is sounding DOS's death knell just yet.

"DOS and the DOS applications people have been using for years aren't going to just stop working one day," industry consultant Bonner says. "They are going to work as well tomorrow as they do today, just like CP/M still works."

"I don't think anyone should ever feel compelled to switch if they are happy with what they have. If they want to do more, they have a decision to make."

At IBM, the future is OS/2. As Casey explains, if someone is interested in a 32-bit multitasking operating system (as promised with Chicago), "that person is the perfect candidate for OS/2, because you can run up to 244 individual DOS sessions. You can even have different versions of DOS in different sessions." In the meantime, Casey says, the next version of IBM PC DOS will bring OS/2's workplace shell to the DOS platform. This will give users of systems with 2MB or less of RAM, including 286s, a GUI on top of DOS.

Novell "will continue to push the envelope and improve the [DOS] environment," maintains John Constant, the company's DOS product-line manager. Moving to Windows 3.1 or higher, he says, is often more a question of whether your hardware will handle it. "Novell DOS 7 will run on a lower-end system than NT. If users want a multitasking DOS system, they can have that with Novell DOS 7."

Given Microsoft's clout, it's hard to discount the likelihood of a future filled with Windows products. In two or three years, if you want to use one of the new operating systems and are willing to invest in its hardware requirements, your choice might be DOS 7 for command-line-only work, Windows NT for networked systems, or Chicago.

"DOS users who want to stay strictly with DOS will have that option," Microsoft's Friedman says. "But if they're doing desktop applications, such as spreadsheets and word processing, and decide to move to Windows because there's some compelling Windows application, then they'll have a choice."

Ultimately, whether it's for Windows or another wonder-product, your decision to step up to the next level of computing should be based *not* on what the industry wants to sell you but simply on what you need to get your work done. ■

WINDOWS SHOPPING

Currently, there are three versions of Microsoft Windows available or in the testing stage.

Windows 3.1: Not an operating system, but a graphical user interface that sits atop DOS. It connects your operating system to your Windows application and provides a stronger visual environment than the DOS command line.

The Chicago Project (Windows 4.0): Due in the second half of 1994. The new GUI will look a lot different from Windows 3.1. It will offer 32-bit computing power to Windows and will *not* run on top of DOS, but will incorporate its own operating system.

Windows NT: A 32-bit operating system that offers true multitasking and support for multiprocessing computers. It also supports multithreading and has built-in client and server networking. The Advanced Server version adds central network management. NT does not sit on top of DOS, but it can run some DOS and many standard Windows programs. NT also offers security for the applications that run on it.

—A.F.L.

A DOS AND WINDOWS Paradox

If you're a fan of the DOS version of Paradox, you might not recognize its Windows counterpart.

by Chris O'Malley

SOME DOS AND WINDOWS VERSIONS OF THE SAME PROGRAM ARE virtually identical, but that's definitely not the case with Borland's Paradox database. In fact, the two are about as different as two members of the same family can be. □ Paradox 4.5 for DOS updates an aging 1-2-3-style interface to support multiple windows, pull-down menus, and a mouse—among other things. But the program still is built around a somewhat clunky and sometimes inconsistent text-based display that bears little resemblance to the cleaner Windows database. Paradox 4.5 for DOS seems behind the times in other ways, too. Although it lets

you switch back to its earlier interface, learning your way around the Paradox 4.5 for DOS interface doesn't give you a leg up when it comes to using Paradox for Windows.

The High Points

For sheer speed, Paradox for DOS remains a better choice than its Windows cousin—and possibly a better choice than any other program out there,

save perhaps for Microsoft's FoxPro. Whether you're sorting, querying, or indexing a database, Paradox 4.5 for DOS makes short work of your requests. Paradox for Windows is no lazy dog, but it's certainly not a greyhound, either. This shortcoming is a bit galling, because the Windows edition requires considerably more hardware horsepower. Paradox 4.5 for DOS runs on a 286 system

Paradox 4.5 for DOS, \$795;
upgrade from version 4.0, \$99.95
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Chris O'Malley is a free-lance writer based in Boynton Beach, Fla. He has been writing about computers for 10 years.

with as little as 1MB of memory, although 2MB is recommended. As is typical for Windows programs, Paradox for Windows requires at least a 386 system with 4MB of memory; 6MB is recommended. You also need at least 15MB of hard disk space to install the Windows version, compared with 5MB for the DOS version.

Still, in terms of features and methods, Paradox for DOS seems a bit dated in comparison to the Windows edition. Both have all the basics: relational capabilities for linking databases, "query by example" facilities that provide quick responses to your searches, form and report designers for better-looking output, graphics features to enhance your presentations, and application-building tools for creating a customized database system. But Paradox for Windows' graphical screens make many of these tasks easier, and, because every element of a database is treated as a separate object, or building block, with its own set of properties and methods, customizing a database also is easy. The Object Inspectors option in Paradox for Windows, for instance, lets you point to anything on the screen and click on the right mouse button to change such properties as the object's color, font, and size, and, in some cases, its behavior or relationship to other objects. The same principles apply to Paradox for Windows' database programming language, ObjectPAL.

TIP HOW TO BYPASS PROGRAM MANAGER

For DOS jockeys, Program Manager is one of the most irritating parts of Windows. Many seasoned users simply don't want to bother with groups and icons. However, Windows' File Manager offers an easy-to-use graphical representation of everything that's on your disks and really does have several advantages over DOS for file housekeeping chores.

Fortunately, you can start Windows and go straight to File Manager, bypassing Program Manager entirely. Just load Windows at the DOS prompt by typing the command `WIN WINFILE` or adding this command to the end of your `AUTOEXEC.BAT`.

You may achieve a similar result by changing the line that reads `Shell=PROGMAN.EXE` in your Windows system initialization file. Just load `SYSTEM.INI` into your word processor and change this line to read:

```
Shell=WINFILE.EXE
```

For a quick way to bring `SYSTEM.INI`, or any other INI file, into the Notepad accessory and begin editing, choose Run from the File menu in Program Manager or File Manager, type `SYSTEM.INI` (or the name of the INI file you want to edit), and press Enter. You also may double-click on `SYSTEM.INI` in File Manager. Windows' Notepad is associated with INI files, so it launches and opens the INI file you specify in one step.

—Kay Yarborough Nelson

File compatibility between the two Paradox versions is mostly a one-way street heading in the Windows direction. Paradox for Windows can dip into Paradox for DOS files—as well as dBase files—without the aid of a conversion utility, but Paradox 4.5 for DOS *can't do the same* with the Windows version's files. Fortunately, however, the Windows version can export tables to the DOS format.

The news is worse for those who put a lot of effort into designing DOS applications using the Paradox application language, or PAL: You can't convert PAL applications into ObjectPAL. You can run Paradox for DOS within Windows, however, and because Paradox 4.5 now supports the DOS Protected-Mode Interface (DPMI), Paradox 4.5 for DOS may use extended memory in Windows' Enhanced mode, just as Windows programs do.

The Road Ahead

If you're looking for a clear migration path from the Paradox 4.5 for DOS to the Windows version of Paradox, you'll look in vain. Except for the basic compatibilities noted above and a discount upgrade price, Paradox 4.5 won't ease a later transition to Paradox for Windows. But Borland says that it intends to continue the DOS version for the foreseeable future, and the number of Paradox 3.5 and 4.5 users still hanging makes it

likely that at least one more Paradox for DOS upgrade will come down the pike. As with Quattro, however, it's clear that Borland is pouring most of its energy and innovations into the Windows edition.

Into which do you invest your time and money? The answer probably lies as much in where you're coming from as in where you're going. If you already use Paradox for DOS, and have a heavy workload and a real need for speed, Paradox 4.5 will do more for you with less upheaval than the radically different Paradox for Windows. If you're applications are less speed driven, or you're moving to Windows in other areas anyway, Paradox for Windows is as elegant and sophisticated a database as you'll find under any operating environment. Just be sure you consider the kind of hardware—and maybe retraining—you'll need before you step up to Paradox for Windows. ■

WHICH WordPerfect?

Just because a program runs under Windows doesn't mean
it's necessarily better.

by Kay Yarborough Nelson

MANY LONG-TIME WORDPERFECT USERS ARE FACING AN UPGRADE decision. WordPerfect 6 for DOS, which replaces WordPerfect 5.1 for DOS, already is available, and WordPerfect 6 for Windows, which replaces WordPerfect 5.2 for Windows, is also on the streets. (WordPerfect 5.2 for DOS never existed.) ☐ If you find yourself drifting steadily toward Windows, you might assume that the new Windows version of WordPerfect for Windows is your logical choice. But that's not necessarily the case; the new DOS version may be all you want—and all you need. ☐ WordPerfect 6 for DOS clearly is the most potent word processor on the market.

It is so powerful, in fact, that it makes you think you're using a Windows word processor. First of all, you may use a mouse while working in any of the program's three screen types: text mode, which is very fast; graphics mode, which shows what-you-see-is-what-you-get (WYSIWYG) fonts; and page mode, which displays page elements such as headers, footers, and footnotes. You also

get icons and button bars (in page or graphics mode), zoomable document views, a formatting ribbon that you may control with a mouse, an Undo feature, sound and fax capabilities, and many other Windows-like features.

In some respects, WordPerfect 6 for DOS outdoes WordPerfect 5.2 for Windows, offering a collapsible outliner, support for almost all font

WordPerfect 6 for DOS, \$495;
upgrade from version 5.1, \$129
WordPerfect 6 for Windows, \$495;
upgrade from version 5.2, \$95

WordPerfect Corp.
1555 N. Technology Way
Orem, UT 84057
800-451-5000

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types, style sheets and merging methods that are easier to use, and a greater selection of symbols. If you work with files of many different types, the program's ability to import files seamlessly from numerous word processors, graphics programs, and spreadsheets is worth the cost of upgrading from version 5.1 for DOS. Among the file types WordPerfect 6 for DOS supports are WinWord, Ami Pro, Word, Excel, Quattro Pro, WordStar, Lotus 1-2-3, PlanPerfect, TIF, BMP, WMP, CGM, PICT (Macintosh format), EPS, and PCX.

System Requirements

If you plan to dump WordPerfect 5.1 for DOS in favor of the new DOS or Windows version, have a 386 or 486 system handy, and be sure it has lots of RAM and a good-size hard disk. If you have a 286, stay with version 5.1 for DOS until you upgrade your system.

Version 6 for DOS takes about 16MB of storage space, and the latest WordPerfect for Windows version undoubtedly will want even more room. On my 20MHz 386 with 8MB of RAM, which is on the slow side for a 386, WordPerfect 6 for DOS is sluggish in graphics and page mode, so I stick to text mode unless a WYSIWYG presentation is essential. Running WordPerfect 6 for DOS on a 33MHz 486 with 16MB of RAM eliminates the speed problem, giving even graphics mode quite a bit of zip.

If you have a 386, you may speed up WordPerfect 6 for DOS by running it under Windows. Windows' more sophisticated use of memory noticeably increases the speed with which graphics- and page-mode screens are updated.

Making the Switch

WordPerfect 6 for DOS works hard to keep the

learning curve low. As with version 5.2 for Windows, version 6 for DOS lets you choose whether to use DOS-style keystrokes or Windows' common user access (CUA) keystrokes, which are the same in almost all Windows programs. If you upgrade to version 6 for DOS from version 5.1, most of the DOS-style keystrokes are the same. You can save time by using the DOS-style keyboard until you get used to the idiosyncrasies of Windows' keyboarding. As you get acclimated, switch to the CUA keyboard so that you may use the same keystrokes that your Windows programs require.

Files created by WordPerfect for DOS versions 4.1 through 5.1 and WordPerfect for Windows are compatible with version 6 for DOS, and you may save version 6 for DOS files in version 5.1 for DOS format. (Files created in version 6 for Windows are also compatible with version 6 for DOS.)

WordPerfect Corp. licenses you for any version of WordPerfect—Windows, DOS, or OS/2—with the purchase of any one version. The company does ask, however, that if you run WordPerfect on different machines, you purchase a copy for each of them.

You Decide

My recommendations are straightforward. If you've invested considerable effort in creating macros under version 5.1 for DOS, and you don't need features such as e-mail and faxing, watermarks, hypertext for building interactive documents, file encryption, full-screen WYSIWYG, or sound capabilities, stick with it. You can convert version 5.1's macros to version 6, but you must do a little tweaking to get them to run properly. If you want a better DOS word processing program with almost all the features of a Windows word processing program, get WordPerfect 6 for DOS, and run it in text mode.

WordPerfect 6 for Windows has the same feature set as version 6 for DOS, as well as extra features such as a subtly redesigned interface, document templates, drag-and-drop reformatting, and a new PowerBar, but it is a Windows program rather than a Windows-like program. That means that it will let you take advantage of multitasking, object linking and embedding, and dynamic data exchange. If you need these features, you need WordPerfect 6 for Windows. ■

TIP

BOGUS WARNINGS ABOUT THE PERMANENT SWAP FILE SIZE

A silly bug in Windows 3.1 displays a bogus warning message whenever you try to create a permanent swap file that's larger than the size recommended by Windows.

To create a permanent swap file, open the control panel, double click on the "386 Enhanced" icon, click on the Virtual Memory button, then click on the Change button. If you select a Permanent Swap file, Windows will display the current file size, the maximum file size, and a recommended size. If you type a size that's larger than the recommended size, Windows will display a message saying that it won't use any space past the recommended size. This message is incorrect and should be disregarded. You can specify any size up to the maximum without wasting space.

—Doug Lowe

STREAMLINING Directories

Save precious hard disk space by deleting unnecessary DOS and Windows files.

by Doug Lowe

MANY USERS GULP WHEN THEY SEE HOW MUCH DISK SPACE DOS AND Windows require. The latest incarnation of MS-DOS, version 6.2, weighs in at about 7MB, while Windows 3.1 uses a hefty 10MB. But do you really need all of those files? □ For many users, the answer is no. Usually, you can free several megabytes of space on your hard drive by deleting the ancillary files you don't use. Most everyone, for example, can get by without the likes of DOS's COUNTRY.SYS, SMARTDRV.SYS, and README.TXT, and few have a good reason for holding onto all of Windows' wallpaper files, not to mention its README files. □ Be careful as you

dump excess baggage, though, lest you inadvertently delete a file DOS or Windows can't live without.

Canning an Old DOS Version

First, scan your directories for old versions of DOS on your hard drive. If, for instance, you've upgraded to version 6.x, you might be carrying your previous DOS without knowing it. That's because 6.x's Setup program copies your old DOS version to a temporary directory. MS-DOS 6 and MS-DOS 6.2 name this di-

rectory \OLD_DOS.1. (Future upgrades will relegate old versions to \OLD_DOS.2, \OLD_DOS.3, and so on.)

DOS saves old versions so that you have the option to revert to them using the Uninstall disk that the Setup program creates. But if you're sure you'll never go back to your previous DOS, you should delete your \OLD_DOS directories. This reclaims several megabytes per directory. DOS even provides a special command, DELOLDOS, to ensure that the procedure goes smoothly. Just type the command at the

Doug Lowe is the author of 15 computer books including *The Only DOS Book You'll Ever Need* (Murach), *The Least You Need to Know about DOS* (Murach), and the forthcoming *Microsoft Guide to DoubleSpace* (Microsoft Press).

DOS FILES YOU CAN LIVE WITHOUT

DEVICE DRIVERS

You may delete the following files if they aren't mentioned in your CONFIG.SYS file.

Filename	Description	Amount of Disk Space Freed ^[1]
ANSI.SYS	Gives you greater control over your keyboard and screen.	9K
COUNTRY.SYS	Provides support for foreign-language character sets.	17K
DISPLAY.SYS	Provides support for foreign-language character sets.	16K
DRIVER.SYS	Provides logical drive support for floppy disks.	5K
EGA.SYS	Used with the task swapper for EGA monitors.	5K
PRINTER.SYS	Provides code-page switching for printers.	19K
RAMDRIVE.SYS	Creates a RAM disk.	6K
SMARTDRV.SYS	Superseded by SMARTDRV.EXE.	8K

MEMORY MANAGEMENT FILES (386 and 486 processors)

You may delete these files if you have a 286-based computer.

CHKSTATE.SYS	Used by MemMaker.	42K
EMM386.EXE	Provides expanded- and upper-memory support.	115K
MEMMAKER*. *[2]	Optimizes upper memory.	137K
SIZER.EXE	Used by MemMaker.	7K

DOUBLESPEACE

If you don't use DoubleSpace, you may delete these files.

DBLSPACE*.*	DoubleSpace files.	900K
DBLWIN.HLP	Windows help file for DoubleSpace.	6K

MICROSOFT UTILITIES

You may delete these files if you use a third-party utility, such as Central Point Software's PC Tools.

MSAV*.*	DOS's antivirus utility.	261K
MSBACK*.*	DOS's backup utility.	725K
MWAV*.*	Antivirus utility for Windows.	509K
MWBACK*.*	Backup utility for Windows.	836K
MWUNDEL*.*	Undelete utility for Windows.	166K
UNDELETE*.*	DOS's undelete utility.	26K
VSAFE.COM	Memory-resident portion of DOS's antivirus utility.	63K

SELDOM-USED DOS FILES

You may delete these files if you don't use their associated commands.

APPEND.EXE	Lets you set up a search path for data files.	11K
DOSSHELL*.*	Starts the DOS shell, DOS's menuing system.	428K
DOSSWAP.EXE	The task-swapping component of the DOS shell.	19K
EDLIN.EXE [3]	A line-oriented text editor that was largely replaced by EDIT.COM.	13K
EXE2BIN.EXE [3]	Converts EXE files to binary format.	8K
INTER*.*	Files that let you establish a rudimentary client-server link between two PCs.	55K
POWER.EXE	Power management utility for laptops.	8K
RECOVER.EXE [3]	A potentially dangerous last-ditch file-recovery utility.	9K

[1] The amount of space you gain applies to MS-DOS 6.

[2] If you use MEMMAKER.EXE, be sure to keep CHKSTATE.SYS and SIZER.EXE, two files that MemMaker requires.

[3] From MS-DOS 5.

DOS prompt and follow the instructions on the screen.

Pruning Unneeded DOS Files

To free up even more space, you should delete unnecessary files from your \DOS directory. None of the files that DOS provides is completely useless, but many are helpful only in certain situations. The table "DOS Files You Can Live Without" lists the most likely candidates for deletion. (I have included some files from past versions of DOS, in case you *haven't traded up*.)

But rather than deleting these files immediately, consider moving them to a temporary directory for a while. For example, you might move them to a directory named \DOS_TEMP and leave them there for about a week or so. Then when you're sure that you don't need them, go ahead and delete these files.

Cutting Back on Windows

Removing unneeded Windows files is a little more complicated. Windows has many more files than DOS does, and they are located in several subdirectories. In addition, it's not always clear which files are important, because Windows uses INI files to control start-up actions. If you should unwittingly delete a file that is referenced in an INI file, you'll find yourself with a problem.

To make matters worse, many applications written for Windows commit the unforgivable sin of adding files to one of Windows' own directories. If you see

a file that you don't recognize, it may not be a Windows file at all!

I recommend that you avoid manually deleting files from your Windows directories. Instead, use Windows' Setup program to remove components of Windows that you don't need. To run Setup, open the Main group and double-click on the Windows Setup icon. Then, select the Add/Remove Windows Components command from the Options menu. When you do, a dialog box is displayed.

From this dialog box, you may delete nearly 2.5MB of README files, accessories, games, screen savers, and wallpaper. To delete an entire category, click on its box to remove the check mark. (From the keyboard, press Tab to move the pointer to the appropriate box, and then press the spacebar.)

To delete certain files, select the appropriate Files button and a list of the component files is displayed so that you may choose the ones you want removed.

Take a few minutes to lighten your DOS and Windows load. If hard disk space is at a premium, your time will be well spent. Deleting the complete set of DOS device drivers mentioned in the table frees up 87K and getting rid of Windows' README files opens up an additional 308K.

If this doesn't free enough space, the table "Windows Files You Can Live Without" lists some Windows files you can delete manually. ■

WINDOWS FILES YOU CAN LIVE WITHOUT

FILES REQUIRED FOR STANDARD MODE

You can delete these files if you have a 386 or 486 computer and you always run Windows in Enhanced mode.

Filename	Description	Amount of Disk Space Freed[1]
*.2GR	Standard mode grabber files.	9K
DOSX.EXE	The DOS extender.	33K
DSWAP.EXE	Task swapper for non-Windows applications.	27K
KRNL286.EXE	The kernel file for Standard mode.	72K
WINOLDAP.MOD	Required for non-Windows applications in Standard mode.	31K
WSWAP.EXE	Task swapper for Windows applications.	16K

FILES REQUIRED FOR ENHANCED MODE

If you do not have a 386 or 486 computer with at least 2MB of memory, you can run Windows only in Standard mode. You can therefore delete these files, which are used to support Enhanced mode.

*.386	Drivers for Enhanced mode.	45K
*.3GR	Enhanced mode grabber files.	30K
CGA??WOA.FON	CGA fonts for non-Windows applications.	11K
CPWIN386.CPL	The 386 Enhanced control panel option.	105K
DOSAPP.FON	Fonts for sizable text in non-Windows applications.	37K
EGA??WOA.FON	EGA fonts for non-Windows applications.	14K
WIN386.EXE	Virtual Machine Manager.	545K
WIN386.PS2	PS2 support.	1K
WINOA386.MOD	Enhanced mode support for non-Windows applications.	49K

OTHER ACCESSORY PROGRAMS

You can delete the files for accessory programs you don't use, but be sure to remove the corresponding icon in the appropriate Program Manager group.

CLIPBRD.EXE	Clipboard viewer.	19K
PIFEDIT.EXE	PIF editor.	55K
PRINTMAN.EXE	Print Manager.	43K
SYSEdit.EXE	System Editor.	19K
WRITE.EXE	Windows Write.	245K
WRITE.HLP	Windows Write Help.	37K

FILES SUPERSEDED BY MS-DOS 6

If you've installed MS-DOS 6 or 6.2, you can delete these files because more current versions of them are found in the DOS directory. Before you proceed, however, make sure the DOS files are on your disk.

EMM386.EXE	Expanded and upper memory manager.	110K
HIMEM.SYS	Extended memory manager.	14K
MOUSE.COM	Mouse driver.	29K
MOUSE.INI	Mouse driver initialization file.	28K
MOUSE.SYS	Mouse driver.	30K
MSD.EXE	Microsoft Diagnostics.	156K
MSD.INI	MSD initialization file.	1K
RAMDRIVE.SYS	Support for RAM drives.	6K

[1] The amount of space you gain applies to Windows 3.1.

PUTTING THE SQUEEZE On Windows

If you install Windows on your system, you'll need all the hard disk space you can get. The disk-compression software that comes with MS-DOS can help.

by Doug Lowe

NO MATTER HOW MUCH SPACE YOUR HARD DISK HAS, WINDOWS AND its applications have a way of filling it. A 40MB hard disk that offers plenty of room for your DOS programs simply won't cut it for Windows, whose program files eat up about 10MB all by themselves. □ Most full-featured Windows programs also take about 10MB, but some require more. My Windows-based C++ compiler, for instance, eats up 35MB. The clip art that accompanies most graphics and desktop-publishing software chew up more space, and fonts are greedy, too—my system's 294 fonts consume nearly 13MB. Sound files, which seem to accumulate

rapidly once you add a sound card to your system, also are disk hungry. More than 6MB of my hard disk is devoted to sound files, and my collection is limited to a handful of choice Inspector Clouseau clips and a few memorable lines from Saturday Night Live.

MS-DOS 6.x's DoubleSpace disk-compression program is a godsend for Windows users. It can reduce the size of its disk-hungry program files, those with an EXE, DLL, or SYS extension, by about 40 percent. Certain types of Windows files benefit even more from Double-

Space. Bit-mapped (BMP) files, for example, may shrink by 80 percent or more. I've experienced this firsthand. When DoubleSpace finished compressing one of my larger bit-mapped files, a 277K behemoth, it took up just 23K—an 88-percent reduction.

Unfortunately, the savings are more modest with other types of files. My 13MB of TrueType font (TTF) files, for instance, shrank an average of only 17 percent, and my 6MB of sound (WAV) files didn't fare any better. Why? Because these files contain highly random data.

Doug Lowe is the author of 15 computer books including *The Only DOS Book You'll Ever Need* (Murach); *The Least You Need to Know about DOS* (Murach), and the forthcoming *Microsoft Guide to DoubleSpace* (Microsoft Press).

DoubleSpace works best on files that contain a lot of repetition.

But DoubleSpace doesn't really support Windows, or vice versa; it's up to you to coax them into peaceful coexistence.

Knowing Your Limits

Initially, things should go smoothly. You'll have no trouble, for instance, installing Windows on a drive that you already compressed with DoubleSpace. It's also simple to use DoubleSpace to compress a disk on which Windows is installed, and you can store Windows programs on DoubleSpace drives.

But you can't use DoubleSpace to manage compressed drives while Windows is running. If you try, you get a "You are running Windows" error message. To run DoubleSpace, you must quit Windows, invoke DoubleSpace from the DOS prompt, and restart Windows when you're done.

This frustrating limitation has a number of implications, none of them encouraging:

- You can't change the estimated compression ratio for a compressed drive while Windows is running. This is a shame, because you often can open up space on a supposedly full disk by bumping up the compression ratio.
- You can't change the size of a compressed drive while Windows is running. Again, this is unfortunate because DoubleSpace lets you increase or decrease the amount of disk space devoted to your compressed drives whenever you wish. It would be convenient to add space to a compressed drive while Windows is running.
- You can't create a new compressed drive while Windows is running. Not that you'd need to often, but what if you want to compress a floppy disk?
- Under MS-DOS 6, you can't insert a new compressed floppy disk while Windows is running, because you must type `DBLSPACE /MOUNT` before you use a compressed floppy disk.

Microsoft lifted the final limitation

in MS-DOS 6.2, adding an Automount feature that automatically recognizes compressed floppy disks whenever you insert them. You still can't type `DBLSPACE /MOUNT` while Windows is running, but Automount makes this command unnecessary.

MS-DOS 6.2 provides another noteworthy improvement for Windows users who rely on DoubleSpace: the ability to type the `DBLSPACE /LIST` or `DBLSPACE /INFO` command while Windows is active. Both programs give you vital information on your drive setup (see the sidebar "Windows-Friendly DoubleSpace Commands").

Information, Please

One concession that both MS-DOS 6 and 6.2 make to Windows is the addition of the DoubleSpace Info option in File Manager's Tools menu. To use this option, simply select a drive by clicking on its icon, then choose the DoubleSpace Info command from the Tools menu. A window such as the one in the figure "The DoubleSpace Info Option" appears.

The window's Show Details button lets you

WINDOWS-FRIENDLY DOUBLESPEACE COMMANDS

When DoubleSpace made its debut in MS-DOS 6, it wasn't very accommodating towards Windows. If you wanted to issue a DoubleSpace command, you had to exit Windows first. MS-DOS 6.2, however, lets you invoke DoubleSpace in two situations.

To display a list of all DoubleSpace drives, temporarily exit to DOS by selecting the MS-DOS Prompt option in the Main group and typing:

```
DBLSPACE /LIST
```

(If you frequently "shell" to DOS in this way, it makes sense to set up an MS-DOS icon in Program Manager by pressing Alt-Enter while you are at the DOS prompt. This puts the DOS screen in a window, and you may then click on the down arrow in the window's upper right-hand corner to shrink the window to an icon.)

The resulting display shows the host drive and Compressed Volume File (CVF) filename for each compressed drive, information that gives you an overall picture of your DoubleSpace setup.

To display detailed information for a particular compressed drive, you may use this command:

```
DBLSPACE /INFO drive:
```

replacing *drive* with the letter of the drive in which you're interested. If you omit the drive designation, DOS displays information for the current drive.

—D.L.

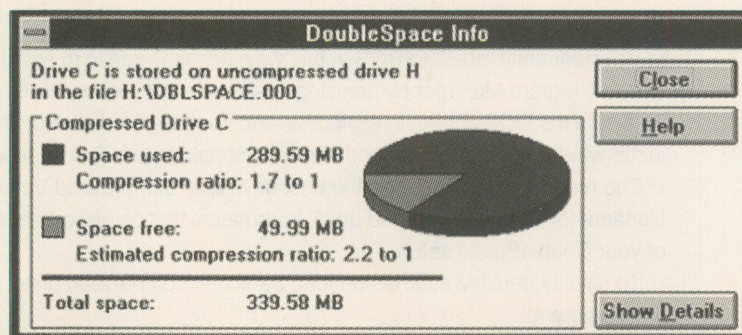
display compression information for specific files. But to use this function, you must select the appropriate files while working in the File Manager window and then activate DoubleSpace Info. When you then click on the Show Details button, the DoubleSpace Info display looks like that in the figure "The Show Details Option." Note that when you select Show Details, this button is replaced by a Hide Details button, which you must select to return to the original DoubleSpace Info window.

A Final Trick

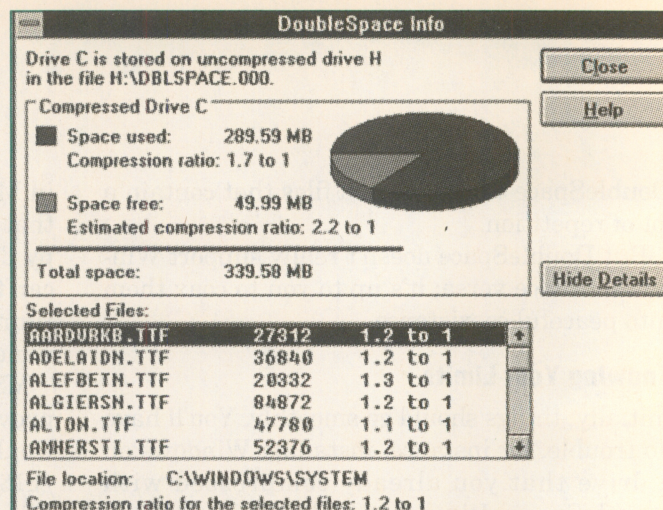
To ensure harmony between DoubleSpace and Windows, you need to know about one further possible sticking point: the incompatibility of compressed drives and Windows' permanent swap files. Windows uses a swap file to fool your programs into thinking your computer has more memory than it actually has. For example, if your computer has 4MB of memory, you may use a swap file to simulate as much as 16MB.

Windows uses two different types of swap files: temporary and permanent. A temporary swap file is created each time you start Windows and deleted each time you exit Windows. In contrast, a permanent swap file is not deleted when you exit Windows; it remains on your disk even when Windows isn't active.

A permanent swap file is more efficient than a temporary swap file, but when you use DoubleSpace, you must take care when setting up a permanent swap file. You can't create one on a compressed drive; the swap file must be stored in uncompressed disk space.



The DoubleSpace Info Option. Windows provides information about the uncompressed host drive for the compressed drive, and shows you how much space is free on the current drive. Here, the host drive for compressed drive C is uncompressed drive H and the Compressed Volume File is named H:\DBLSPACE.000.



The Show Details Option. For compression information on a particular file or group of files, highlight the appropriate files, open the DoubleSpace Info window, and click on Show Details. Windows displays a scrollable list and tells you the size (in bytes) of each uncompressed file and its compression ratio.

DoubleSpace is smart enough to move your permanent swap file to an uncompressed disk when you install it. But if you install Windows after you install DoubleSpace, or if your swap file becomes corrupted and you need to recreate it, you might have to create a permanent swap file manually.

To create a permanent swap file on an uncompressed drive, follow this procedure:

- Start the Control Panel by double-clicking on its icon in the Program Manager's Main group.
- Double-click on the 386 Enhanced icon.
- Click on the Virtual Memory button, then click on the Change button.
- Select an uncompressed drive for the swap file location.
- Select Permanent for the swap file type.
- Type the size you want to use for the swap file in the New Size box. Usually, the amount suggested by Windows is sufficient.
- Click on OK. In order to activate the change, you must restart Windows.

With luck, you'll never have problems with permanent swap files. And if you keep the other rules of peaceful coexistence in mind, DoubleSpace and Windows will get along just fine. ■

RUNNING DOS & WINDOWS Q&A

Here are answers to the 10 questions new
Windows users ask most often.

by Kay Yarborough Nelson

Do I have to use a mouse in Windows?

Short answer: Yes. Although almost every mouse movement has a keyboard equivalent, some operations—such as moving windows and icons—are just plain easier with a mouse.

Help! My mouse doesn't work in my DOS programs anymore!

Some DOS programs let you use a mouse, but, occasionally, when you run such a program under Windows, the mouse doesn't work. This problem usually is caused by one of two conditions: Windows disabled the mouse or Windows can't find your mouse driver.

Windows' Setup doesn't set up the mouse to work outside of Windows, and sometimes it disables your mouse. If your mouse worked before you installed Windows but isn't working now, check your CONFIG.SYS and AUTOEXEC.BAT files. If the line that previously enabled your mouse is preceded by a REM statement, Windows disabled the mouse. Removing the REM usually permits you to use a mouse in mouse-aware DOS programs running under Windows.

If the mouse still doesn't work in your DOS programs, take a look at SYSTEM.INI. Its MOUSE-INDOSBOX line should be set to 1. If you install Windows and don't invoke a mouse driver in your AUTOEXEC.BAT or CONFIG.SYS file, Windows will set this line to zero, which disables the mouse.

When your mouse works in Windows programs but not in mouse-aware DOS programs that are running in a window, the mouse driver probably isn't loaded before Windows starts. If you have a Microsoft mouse or one that's compatible with it, check your AUTOEXEC.BAT to see if it contains a MOUSE.COM line or your CONFIG.SYS to see if it has a MOUSE.SYS line.

Windows' Setup puts the most up-to-date mouse drivers in your \WINDOWS directory, so you also should make sure that this is where your AUTOEXEC.BAT or CONFIG.SYS says that they reside. For example, if you use MOUSE.SYS to set up your mouse, your CONFIG.SYS should contain this line:

```
DEVICE=C:\WINDOWS\MOUSE.SYS
```

If you don't find these drivers in \WINDOWS—perhaps because you didn't have a mouse when

you first installed Windows—you may copy them from the installation disks at any time by expanding either `MOUSE.CO_` or `MOUSE.SY_`, both of which are compressed. Be sure to store the decompressed file in your `\WINDOWS` directory. For instance, to expand `MOUSE.CO_` from a floppy disk in drive A to your `\WINDOWS` directory on drive C, type:

```
EXPAND A:MOUSE.CO_ C:\WINDOWS MOUSE.COM
```

How do I get a program to run automatically when I start Windows?

The simplest way is to drag a copy of its icon into Program Manager's StartUp group. To copy the program's icon into StartUp from the group where it currently resides, display the StartUp window and the icon's current group window on screen. Then, press Ctrl while you drag the icon to the StartUp group.

To copy an icon from File Manager, display the File Manager and Program Manager windows on screen (press Ctrl-Esc to display the Task List window and choose its Tile option), and simply drag the icon, without pressing Ctrl.

You also may edit `WIN.INI`, adding to its `LOAD=` line the commands used to run the programs you want loaded on start-up.

Do I need to set up a Program Information File (PIF) for every DOS program on my hard disk?

Not necessarily. Windows provides PIFs for many popular programs, and many programs nowadays come with their own PIFs. If you don't provide a PIF for a program, Windows uses a generic PIF, `_DEFAULT.PIF`, which usually works fine with most non-Windows programs. But if you're using a common non-Windows program, chances are that you can find its PIF either in your `\WINDOWS` directory or in the program's directory.

Windows uses a PIF every time you start a non-Windows (DOS) program running under Windows. The name of a program's PIF matches the command used to start the program, so, for example, Quattro Pro's PIF is named `QP.PIF` and WordPerfect's PIF is named `WP.PIF`. (Note: To run a program, Windows uses the settings in a program's PIF rather than the settings in its `EXE` file. If the program isn't running as you

think it should, maybe your PIF settings are overriding the `EXE` settings.)

How do PIFs end up in your `\WINDOWS` directory or the program's directory? When you install Windows, or use the Setup program later and tell it to scan your hard disk and set up programs, Windows looks in a file called `APPS.INF`, which holds information about most popular DOS programs. If Setup finds information about the non-Windows programs on your hard disk, but doesn't find corresponding PIFs in the programs' directories, it sets up PIFs for them. You may fine-tune these PIFs or create new PIFs from scratch.

Setting up PIFs for DOS programs gives you a great deal of control over how they run under Windows. A PIF can specify all sorts of options for a DOS program, such as a start-up directory, command-line switches to execute when the program starts, and whether to run the program in a full screen or in a window.

To create or modify a PIF, you must use the PIF Editor (double-click on its icon in the Main group).

I can't get my modem/fax/mouse to work on COM3 or COM4! What's going on?

Normally, Windows doesn't recognize COM3 and COM4, because an interrupt-sharing conflict exists under Windows' multitasking environment. You may, however, use a utility called `MSD.EXE`, which comes with Windows, to see whether your BIOS table shows addresses for COM3 and COM4. If it does, make sure these addresses are the ones assigned to those COM ports in the Ports control panel. To do this, select the port; then choose the Settings and Advanced options.

What, exactly, is a general protection fault? I repeatedly get this error message while I'm running Windows.

According to Microsoft, this message indicates that "something unexpected"—usually a memory-access problem—has happened somewhere in Windows. Such problems might arise when a program tries to make a call to a location in memory that it can't access without going through Windows, which wants to control all calls of this type. Normally, simply pressing Ctrl-Alt-Del shuts down the offending program but lets you keep your Windows environment

running without restarting your computer.

For more information, you may download application note WW0524.ZIP, "Troubleshooting GP Faults," from the Microsoft Library on CompuServe (type G0 MSL after logging on). If you're not on CompuServe, call Microsoft at 800-426-9400 and request the file.

After installing Windows, I upgraded to DOS 6 and then used DOS 6's Double-Space to compress my hard drive. Now when Windows loads, I get a "Corrupt swap file warning" message. How do I get Windows to start?

Windows 3.1 creates a permanent swap file, setting aside space on your hard disk in which Windows may hold data temporarily. But a permanent swap file can't reside on a compressed volume. To eliminate your problem, edit SYSTEM.INI, inserting a `PAGING=OFF` line in the `[386ENH]` section. Then, start Windows and use the 386 Enhanced icon in the Control Panel to set up a permanent swap file (choose Virtual Memory and Change; consult Windows' on-line help if you need it).

Why do Windows applications print so much slower than my favorite DOS applications?

Windows prints in graphics mode, even if you're printing text, and graphics mode printing is slower than text mode printing. Here are a few ways to speed up the process:

- Defragment your disk (you may use DOS 6's `DEFRAG` command if you have DOS 6).
- If possible, use your printer's parallel port instead of its serial port.
- Be selective about the number of fonts you use in a document; the more fonts you use, the slower the printing.

Suddenly, I'm missing one of the icons in the Control Panel. Is there a way I can get it back, without reinstalling Windows from scratch?

Most of the time, this problem arises when Windows refuses to display a program's icon because the file is corrupt. To set things straight, exit Windows and find your installa-

tion disks. Copy `EXPAND.EXE` to your `\WINDOWS` directory from Disk 3. Then locate the compressed file for the Control Panel that you're lacking and expand it into your `\WINDOWS\SYSTEM` directory.

Control Panel files are designated with the extension `CPL`. The filename for the main Control Panel, for example, is `MAIN.CPL`, which is on Disk 4 if you have 3.5-inch disks and on Disk 5 if you have 5.25-inch disks. As with other Windows files, however, `MAIN.CPL` is stored on its installation disk in compressed format. Its filename is `MAIN.CP_`; the underline character (`_`) marks it as a compressed file. To expand the program, type:

```
EXPAND A:\MAIN.CP_ C:\WINDOWS\SYSTEM\MAIN.CPL
```

Now, start Windows, and you should see the missing icon in the Main group.

What's the difference between Enhanced and Standard mode in Windows?

In Standard mode, Windows requires less memory. Standard mode was designed to let Windows 3.0 run on 286 machines equipped with only 1MB of RAM. Windows 3.1 requires 2MB of RAM, however, and normally you'll run it in Enhanced mode, which is the usual way Windows starts when you issue the `WIN` command on a system equipped with a 386 or higher CPU.

Standard mode can be useful, though, particularly if you need to do some system troubleshooting because of hardware incompatibilities. If hardware problems stop Windows from running in Enhanced mode, you may restart it in Standard mode by using the `/S` switch (as in `WIN /S`).

At other times, certain DOS programs run faster under Windows if you start up in Standard mode. WordPerfect 5.1, for example, runs faster in Standard mode if you are working with long documents, particularly if they contain a lot of graphics. If a DOS program is sluggish under Windows, try running Windows in Standard mode.

How can you tell in which mode you are? One sure way is to try to run a DOS program in a window. If it fills the screen and doesn't shrink to a window when you press `Alt-Enter`, you're in Standard mode. Or you may select About from the Help menu in Program Manager or File Manager. ■

(Continued from page 80)

Look for the order form in this issue (page 75), or call 800-349-7327 and ask about the DOS/Windows Companion Disk.

EDOS 3.65h

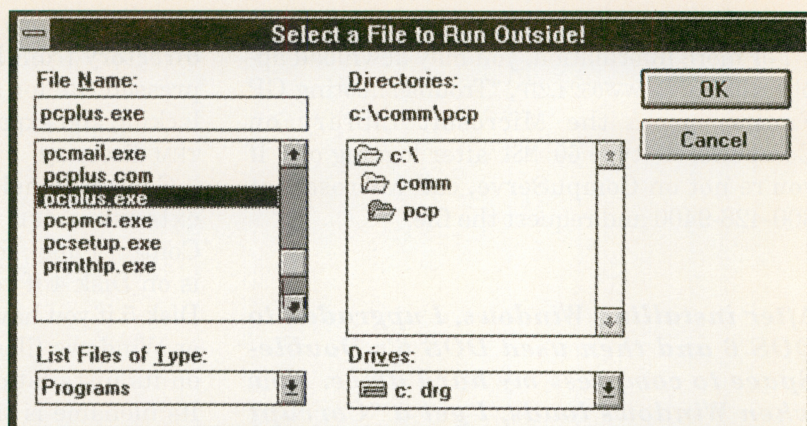
EDOS is a device driver that gives you unprecedented control of your DOS sessions under Windows. If you're running Windows on a 386 or better computer, EDOS makes your DOS sessions "Windows-aware." In many ways, EDOS is a better DOS than DOS!

After installing EDOS, the first thing you'll notice is a new program group with several EDOS icons in it. These icons let you easily configure EDOS and start DOS sessions using various amounts of memory. What's startling is that EDOS allows DOS sessions with up to 768K of memory on some PCs! That's much more than the 640K maximum for DOS alone.

EDOS adds a complete menu bar to your DOS sessions that lets you customize settings and makes cutting and pasting in DOS sessions a breeze. You can view and print the contents of the Windows Clipboard from the DOS prompt. If you are in an EDOS session, run any DOS or Windows program simply by typing its name. You can set alarms in DOS sessions that pop up dialog boxes in Windows to signal that some event has occurred in the session.

In all, EDOS adds 20 new commands to DOS under Windows. At the same time, EDOS modifies or disables DOS commands that cause problems if run under Windows.

There is much more to EDOS, and an exten-



Outside is a Windows program that terminates Windows, runs a DOS program, then restarts Windows, all with a couple of clicks of your mouse.

sive documentation file is included with the program. Installation is easy, with plenty of informative messages to let you know exactly what's being done at all times.

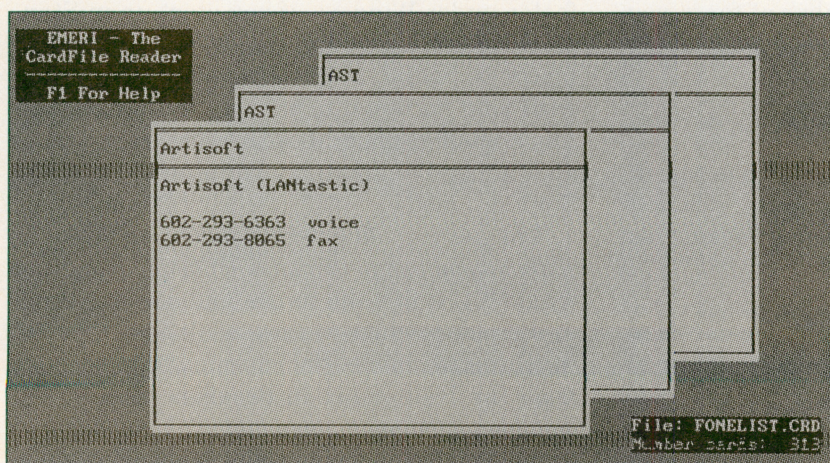
EMERI 1.3

Every copy of Windows includes a handy Cardfile program that's perfect for storing names, addresses, phone numbers, recipes—whatever you might otherwise keep in a Rolodex. I use Cardfile constantly. The only problem is that I'm often at the DOS prompt when I need an item.

EMERI is a DOS application that can read and search Windows' Cardfile files. It displays the Cardfile "cards" three at a time, and lets you scroll through the cards using the Page Up and Page Down keys. You can type in a string of text, and EMERI will find cards containing the string. If there is a phone number on the card, pressing F5 will dial the number if you have a modem attached to your computer.

EMERI isn't fancy, but accomplishes its intended purpose simply and efficiently.

EMERI is a DOS application that can read and search Windows Cardfile entries.



Outside! Version 2a

You may have found that some DOS programs just don't run very well when launched from Windows. The problem is that a DOS program running under Windows does not have the full use of your PC's resources. Some resources are always being devoted to Windows. High-resolution graphics games, especially those

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that support sound boards, may perform poorly or not at all when run from Windows. Likewise, attempts to use a DOS program under Windows for high-speed communications, such as downloading files with a 9600 bps modem, may fail entirely.

One solution to this problem is Outside, a Windows program that terminates Windows, runs a DOS program, then restarts Windows, all with a couple of clicks of your mouse. While the DOS program is running, it is not encumbered by Windows in any way. In fact, all of Windows, except for a small portion of its kernel, is completely removed from memory.

Outside is simple to use. You can create an Outside icon in one of your Windows Program groups, then double-click on the icon to start Outside. Once launched in this way, Outside presents a dialog box so you can select the DOS program you want to run.

If you have problem DOS programs, Outside is the solution you've been waiting for.

SmilerShell 1.3

After working with Windows for a time, you'll probably conclude that, while some things can be done easily by pointing and clicking with the mouse, other functions would be easier if you simply could type in the command or the name of a program you want to run. What you need is a command line for Windows. Enter SmilerShell.

The SmilerShell interface isn't much to look at. Even when maximized, SmilerShell occupies only the top line of your Windows display. But in the empty area below the menu bar, you can type in almost anything. SmilerShell takes over from there. Want to execute a DOS command such as DIR or COPY? Just type it in. A Windows program? Type in the name of the program. A DOS program? Ditto.

SmilerShell looks at what you've typed in and figures out what to do. If what you've typed is a DOS command or the name of a DOS program, SmilerShell launches a DOS session and runs the command or program. I use SmilerShell to run Windows programs, too, because typing the name of the program is often quicker than opening up a group window and double-clicking on an icon, especially if your screen is already full of windows.

WinCLI 3.02

When is a DOS session not a DOS session? When you're running WinCLI, that's when. WinCLI is an acronym for Windows Command

Line Interface. Running WinCLI displays a window that looks remarkably like a windowed DOS session. Don't be fooled, though; WinCLI is a full-fledged Windows program. On WinCLI's command line, you can type in more than 20 common DOS commands such as DIR, DEL, RENAME, and so on.

You may find that running WinCLI is better in several ways than starting a DOS session or performing the same functions in Windows. If you are an old DOS hand but are new to Windows, WinCLI is a handy way to keep on using those familiar DOS commands without leaving the Windows environment. WinCLI also conserves your computer's resources. The usual DOS session under Windows uses about 640K of memory, while WinCLI uses less than 40K. And because WinCLI is a true Windows application, it works fine on 286 systems. ■

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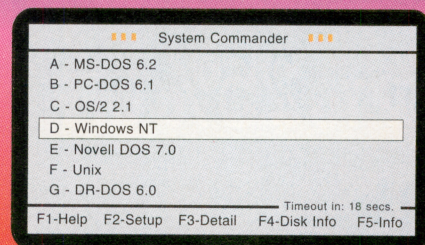
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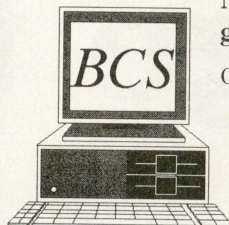
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FIVE APPS THAT Bridge the Gap

We went looking and found five programs that straddle the fence between DOS and Windows. In the process, they make both environments easier to use.

by Jeff DeTray

AS WE PREPARED THIS SPECIAL ISSUE ON THE RELATIONSHIP BETWEEN DOS and Windows, we wondered if there were programs that would prove particularly helpful to those of us who find both environments indispensable. Our search turned up five interesting and useful tools that do the job quite nicely. Each of the programs described below performs a separate function and solves a different set of problems. If you run DOS programs from Windows, prefer to use DOS file-management commands while in Windows, want access to your Windows Cardfile databases from the DOS prompt, wish you had more control over DOS sessions started

from Windows, or just want a DOS-like command line for Windows, these programs will make your day.

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The shareware concept is a simple one. You have the opportunity to test programs on your computer for a limited period of time, typically 30 days, before you buy. At the end of the trial period, you must either pay for the program and become a registered user or stop using the

program altogether. Registration brings you many added benefits, such as discounts on future upgrades and full technical support.

We have made it particularly easy for you to conduct your own test drive of these five excellent programs. We have placed them all on a special Companion Disk that you can obtain directly from *DOS Resource Guide*. It's still your responsibility to pay for the programs that you decide to use, but there's no easier way to try them out. The cost of the disk is only \$13.95.

(Continued on page 74)

Jeff DeTray is the president of BCP Inc., the owner of *DOS Resource Guide*. DeTray is also the founding editor of the magazine and an avid DOS/Windows user.

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